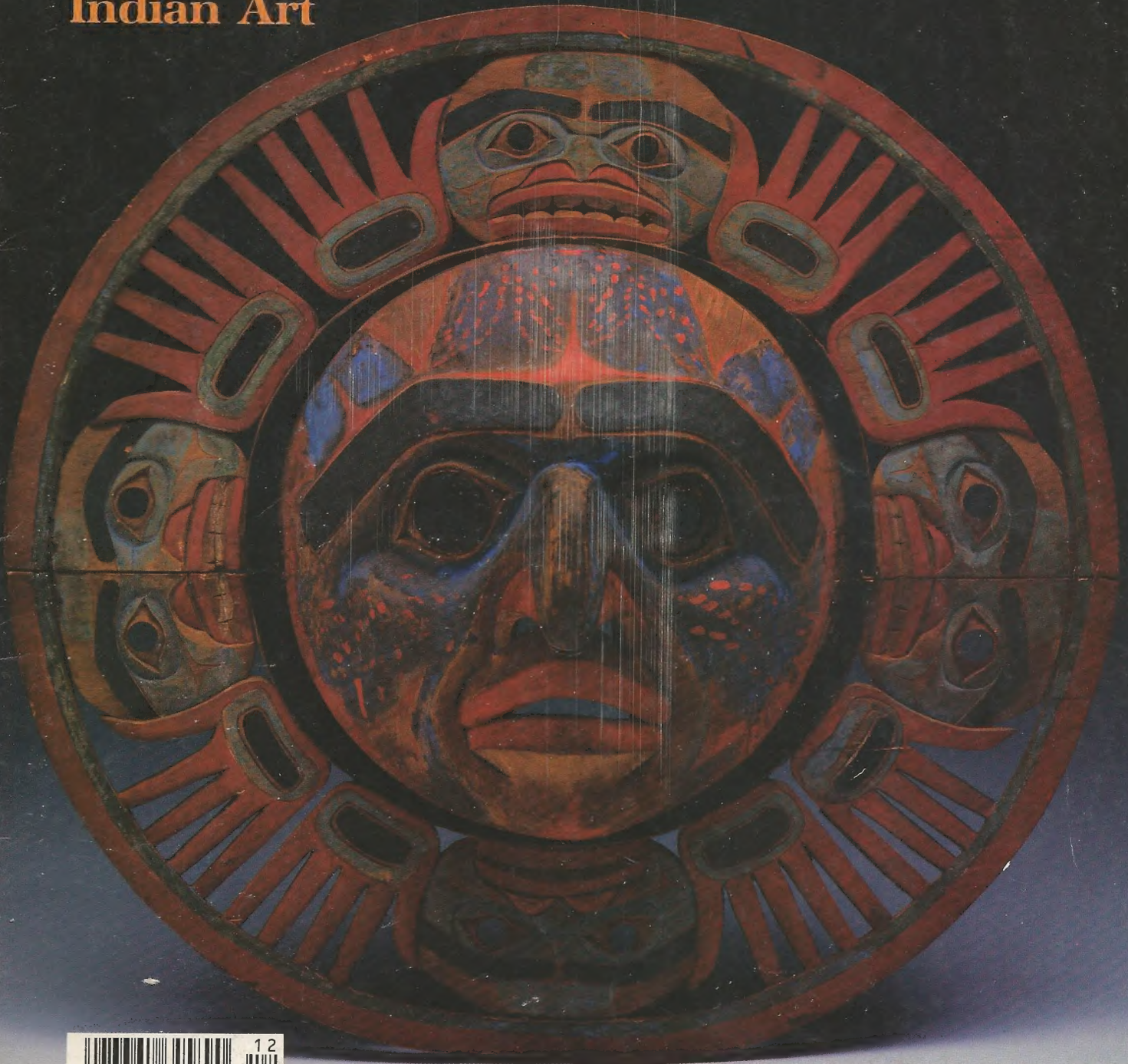
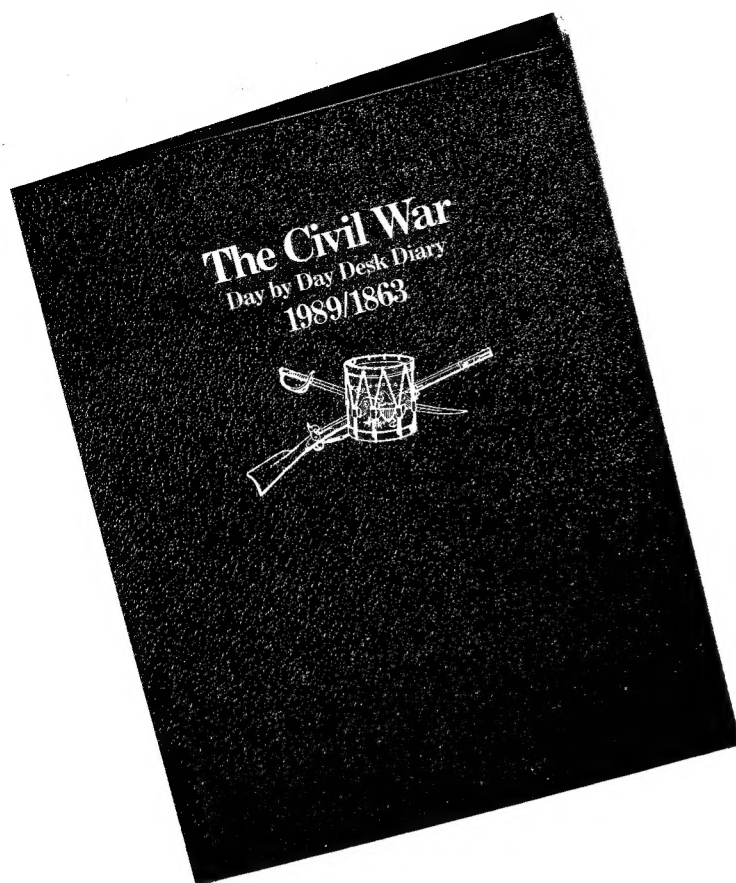


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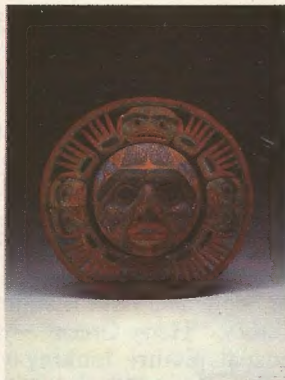


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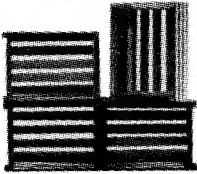


Cover

A representation of the sun, this wooden mask dating from the nineteenth century was carved by Bella Coola Indians on the central coast of British Columbia. The mask is part of the world's greatest trove of Northwest Coast Indian art, preserved and displayed at the American Museum of Natural History in New York City. For a portfolio of treasures from the shores of Canada and Alaska, see pages 30-39.

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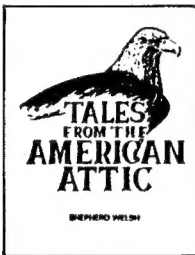
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Ed Holm
Editor

Radio Nostalgia

Just read your October "Editor's Desk" on radio broadcasting of the 1930s and 1940s and was delighted with the trip down Memory Lane. [I particularly remember] *Suspense*, *The Shadow*, and *I Love a Mystery*. After listening to the squeaking door; and swinging across uncounted bottomless pits with Reggie, Doc, and Jack; and trying to figure out what the Shadow knew (and in modern parlance, when he knew it), I have often felt that my children and now grandchildren have been woefully deprived by having everything done for them on the TV screen. They don't know what they are missing, though, and I suppose will have no regrets. *Sic transit gloria mundi.*

Russell Vermillion
Springfield, Virginia

Welles Had Long Walk

Having recently worked out of an office at 485 Madison Avenue, which is located near East 52nd Street (the headquarters of CBS until 1965), I can assure you that Mr. Welles ["Night of the Martians," October issue] would have had to walk far more than "a half-dozen blocks" to reach the Mercury Theatre on West 41st Street—unless, of course, the Martians had totally scrambled the geography of midtown Manhattan during the course of their "invasion" that night.

Charles E. Gersch
New York, New York

The Mercury Theatre, which was located at 108 W. 41st Street, near Sixth Avenue, is more accurately eleven to twelve blocks from the old CBS building at 485 Madison Avenue. The Editors.

Hetty Green Sought in Song

In your September issue is an interesting story, "Hetty Green"—with an unusual picture looking very much like the "Witch of Wall Street!"

Another bit of information about her—in the late 1890s and early 1900s many Broadway shows

had songs and sketchy plays about persons and events reported in the local press. There was a song about Hetty, too. It went after this fashion: "All I want is fifty million dollars, / and Hetty Green to be my little wife!"

As a very little child I recall my father playing this song and singing it, too.

Alice Warner Milton
Chattanooga, Tennessee

Eastman Birthplace

Your September issue contains an excellent article, "George Eastman," in which you brought out with clarity the brilliance and eccentricities of an amazing man.

The article is of special interest to me as an interpreter at Genesee Country Museum at Mumfords, New York, a village of over fifty restored homes, shops, inns, and churches, moved from all over western New York and presenting daily nineteenth-century life through costumed craftspeople and trained interpreters.

I work in George Eastman's birthplace, which was built in Waterville, New York, and moved in 1954 to the grounds of the Eastman House in Rochester, and moved again when acquired by our museum and opened to the public in 1979.

Your article stated his birthplace was a one-story home when actually it's one-and-one-half with three small upstairs rooms. The Greek Revival house sits on our grounds like a jewel with its white pillars and charming interior. We'll be very happy to escort all visitors through and to talk with you about Mr. Eastman and his many contributions to our lives today.

Ginny Shaver
Avon, New York

The editors welcome comments from our readers. While we endeavor to publish a representative sampling of this correspondence, we regret that limited space prevents us from printing every letter. Address correspondence to The Mailbox, American History Illustrated, Box 8200, Harrisburg, PA 17105. ★

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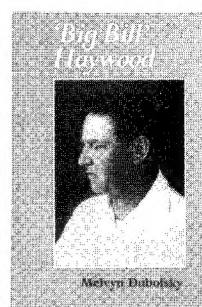
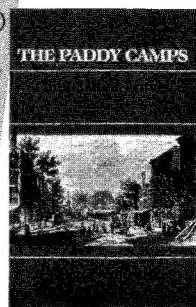
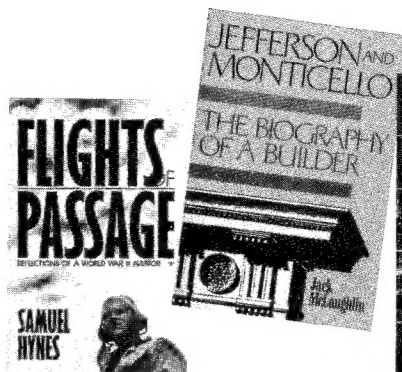
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History Bookshelf



Flights of Passage: Reflections of a World War II Aviator by Samuel Hynes (*Frederic C. Beil, New York City, and Naval Institute Press, Annapolis, Maryland, 1988; 270 pages, \$16.95*).

This memoir by a former U.S. Marine bomber pilot recounts the author's odyssey from eighteen-year-old flight cadet to twenty-one-year-old seasoned war veteran with more than one hundred missions in the Pacific. Much more than a war book, the memoir stands apart for its lyrical passages describing the sensations and emotions of flying—experiences familiar to every military pilot but ones that have rarely been verbalized so well.

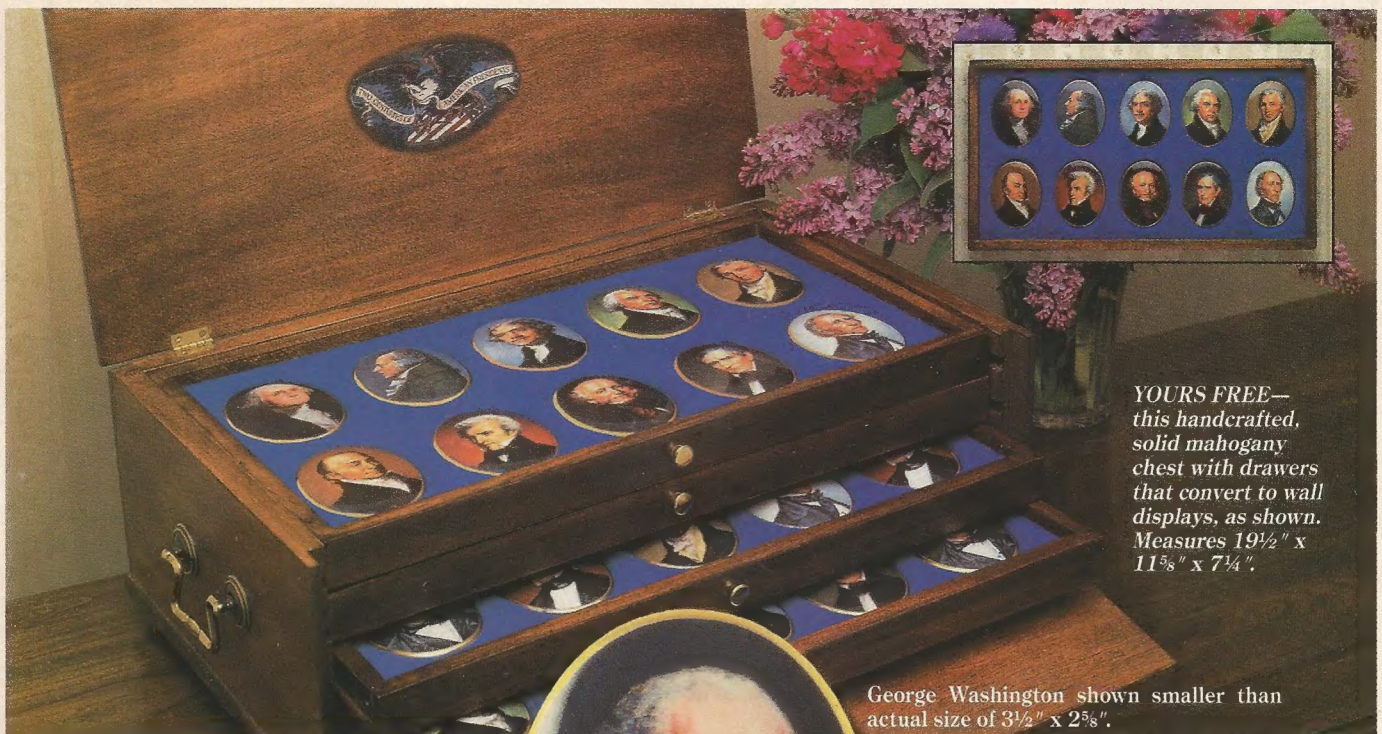
"Big Bill" Haywood by Melvyn Dubofsky (*St. Martin's Press, New York City, 1987; 184 pages, \$19.95*). In September 1917 the *New York Times* called labor leader William D. "Big Bill" Haywood "the most hated and feared figure in America." This concise volume recounts Haywood's life from his youth in America's mountain West to his exile and death in 1928 in the Soviet Union. (An urn containing half of Haywood's ashes was placed beneath the Kremlin wall.) Author Melvyn Dubofsky examines how an ordinary American workingman became the most feared labor radical of his generation; he also explores how government officials used the law to punish radicals such as Haywood, sometimes through coercion or without due process. Haywood's roles in several violent industrial conflicts in American history, from the battles waged by turn-of-the-century miners to the massive upheaval of 1910-1913, are also discussed.

The Paddy Camps: The Irish of Lowell, 1821-1861 by Brian C. Mitchell (*University of Illinois, Chicago and Urbana, 1988; 247 pages, \$24.95*).

Although Lowell, Massachusetts, had in the mid-nineteenth century the largest Irish community in New England excluding Boston, and despite the fact that the wider context of the Irish in America has been much researched, the story of the Lowell Irish has remained largely unexplored. Lowell was the largest of antebellum mill towns. The Irish there maintained their customs and formed settlements called "paddy camps" that removed them from the Yankee mill village. When the mill owners began replacing the female Yankee workers with Irish workers, violence erupted in the area. As relations with the Yankees turned hostile, the Irish sought support within their own community, and, as a result, religious institutions, political awareness, and a sense of shared traditions grew strong.

Jefferson and Monticello: The Biography of a Builder by Jack McLaughlin (*Henry Holt and Company, Inc., New York City, 1988; 481 pages, illustrated, \$24.95*).

Thomas Jefferson spent much of his adult life designing and working on his beloved Virginia estate, Monticello. This unusual biography profiles the third president's domestic life and his consuming passion for building—and later virtually reconstructing—the estate from its ground-breaking in 1769 until his death in 1826. Illustrations of Monticello at various stages enhance the narrative.



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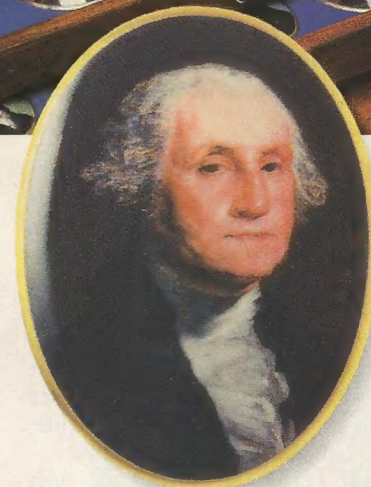
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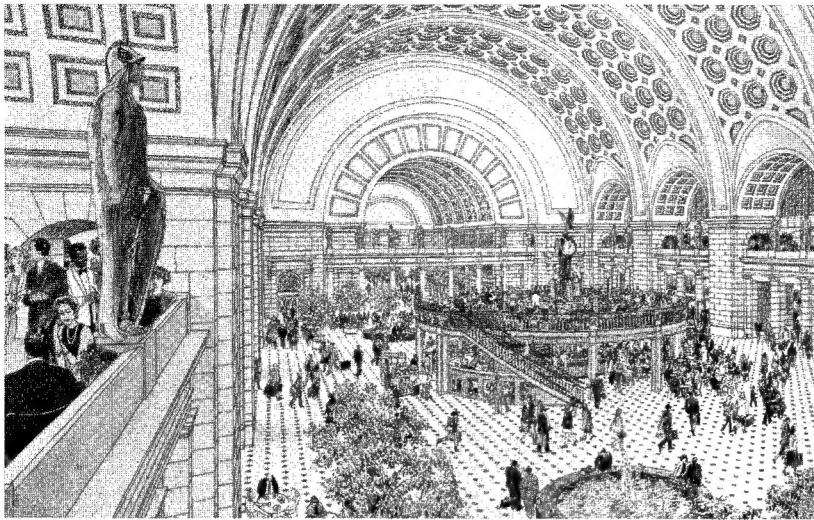
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Capital's Union Station Restored

The beaux-arts splendor of Union Station at 50 Massachusetts Avenue in Washington, D.C., is back following a \$160 million renovation of the eighty-one-year-old train station designed by Daniel Burnham of 1893 Chicago World's Fair fame. The historically significant structure was in danger of demolition when Amtrak, the District of Columbia, and other groups collaborated to restore it to its former use and stature as one of the most striking train stations of the rail era.

The "city in a city" opened in 1907, with one-thousand-plus employees manning its service facilities, offices, shops, and restaurants. It even had its own generating plant, doctor's office, mortuary, and police station. But as train travel declined after World War II, the station lost popularity. For several years during and following the nation's Bicentennial, the National Park Service used the main hall as a national visitor center, but that, too, met with public disinterest, and the building closed in 1981.

Architects combed the Library of Congress and other archival sources for photographs and other materials that would help planners restore the station to its original appearance. The revitalization took about two years.

Architectural alterations were deliberately designed to appear

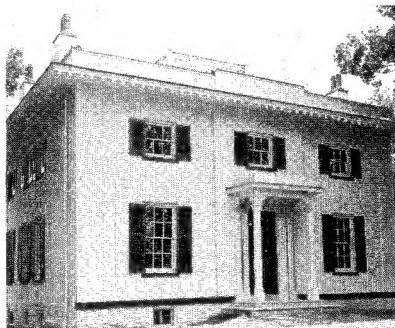
contemporary so as not to be confused with the Romanesque design of the original structure.

Taft Home Reopens

The Cincinnati, Ohio birthplace and boyhood home of William Howard Taft, America's twenty-seventh president, reopened to the public September 17, 1988, following nineteen years of historical research and restoration. (The home's interior had been closed since 1981.) The opening coincides with Cincinnati's bicentennial.

Taft (1857-1930) was the only person ever to have served as both president (1908-1912) and chief justice of the United States (1921-1930). The National Park Service and private groups, seeking a fitting memorial to Taft, meticulously restored the 1840s home and grounds to mirror as closely as possible their appearance before an 1877 fire partially destroyed the structure.

Period furnishings and exhibits



guide visitors through Taft's youth and then his career, which also included governorship of the Philippines, secretary of war under Theodore Roosevelt, and a Yale professorship.

The home is open from 10 A.M. to 4 P.M. every day except Thanksgiving, Christmas, and New Year's Day. For more information, write the park superintendent at 2038 Auburn Avenue, Cincinnati, Ohio 45219-3025, or telephone 513-684-3262.

Commission Says More, Better History in Schools

The history curriculum in American schools is "seriously inadequate in both quantity and quality," according to a Bradley Commission on History in Schools report released in September 1988.

The report noted that 15 percent of American high school students do not take history, and at least 50 percent study neither world history nor Western civilization.

Recommendations include urging school boards and supervisors to allow teachers to design their own courses and teaching methods; urging textbook publishers to stop overloading history texts with facts and go back to telling a good story built around questions meaningful to students; focusing kindergarten through sixth-grade social studies curriculums on history; and requiring history study during four of the six years from grades seven through twelve.

The Commission, established in 1987 to study the apparent decline of quality history education, further suggests that history courses, initiated in the early grades, acquaint today's students with children of other lands and times, and play on children's fascination with heroes, great deeds, and faraway lands.

The Commission's premise is that a knowledge of history is essential for citizens in a free society.

For single copies of the report, send \$3.00 to: Educational Excellence Network, 1112 16th Street, N.W., Suite 500, Washington, D.C. 20036. ★

Bookshelf

Mark Twain's Letters: Volume I 1853-1866 edited by Edgar M. Branch et. al. (*University of California Press, Berkeley, 1988; 616 pages, illustrated, \$35.00*).

Adding significantly to the existing wealth of Twain material is this first of a projected twenty volumes of letters written by the famous author. Volume I includes every known letter Samuel Clemens wrote during his formative years between the ages of seventeen and thirty-one—140 in all. From his start as an itinerant printer to a stint as travel correspondent and later a river pilot, gold and silver miner, and finally roving correspondent and lecturer on the brink of international fame, Twain's personality and lifestyle comes sharply into focus through these letters. The correspondence is extensively annotated, and a section of family portraits and original manuscript pages plus notes and appendices follow the text. For this mammoth series, the Mark Twain Project at the University of California's Bancroft Library in Berkeley has located and documented some ten thousand Twain letters.

December 7, 1941: The Day the Japanese Attacked Pearl Harbor by Gordon Prange with Donald M. Goldstein and Katherine V. Dillon (*McGraw-Hill, New York City, 1988; 493 pages, illustrated, \$22.95*).

The final volume in Prange's posthumously-published Pearl Harbor trilogy, this riveting work represents decades of research by Prange and co-authors Goldstein and Dillon. *At Dawn We Slept* dealt mainly with events leading to the attack, and *Pearl Harbor: The Verdict of History* with individual responsibility for the action. This third volume features eyewitness accounts from pre-attack events on December 6 through Roosevelt's war declaration on December 8. Prange gathered these previously-unpublished accounts from American and Japanese participants immediately after World War II, lending the book an "oral history" flavor. The authors also drew on logs and official reports from the Pearl Harbor fleet to complete this "ultimate Pearl Harbor story."

FREAK SHOW

Presenting Human Oddities for Amusement and Profit Robert Bogdan

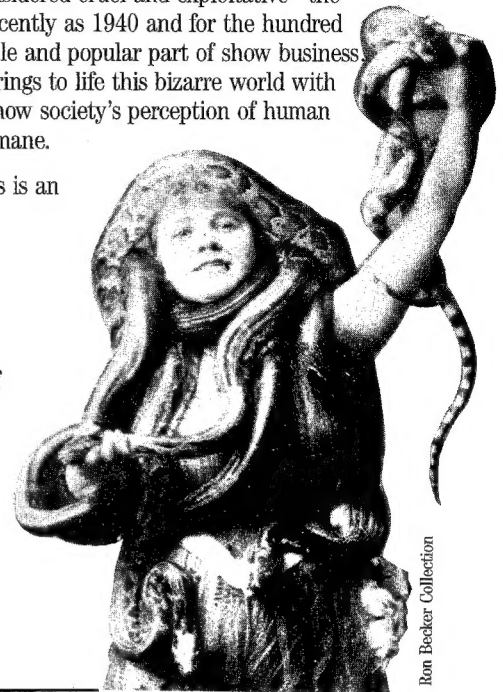
The freak show today would be considered cruel and exploitative—the pornography of disability—yet as recently as 1940 and for the hundred years preceding, it was an acceptable and popular part of show business. Bogdan's absorbing social history brings to life this bizarre world with all its flimflam artistry and shows how society's perception of human oddities gradually became more humane.

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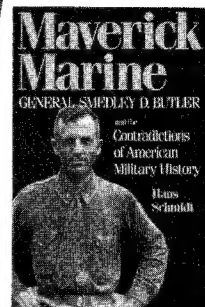
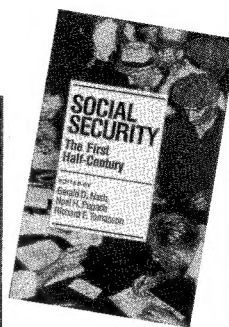
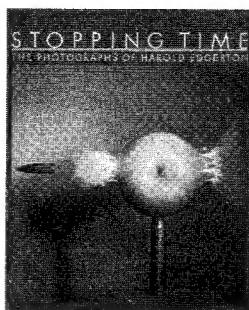
Go ahead. Live it up while you can. Eat anything and everything you want, from those processed meats to fatty dairy products to that extra measure of salt. But do it soon. Because poor eating habits can lead to high blood cholesterol, which can result in clogged arteries, a damaged heart, and an early death. The American Heart Association urges you to eat sensibly. Avoid food high in fat, salt and cholesterol. Avoid eating too much. It could keep you from an early grave and let you live it up a little longer.



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History Bookshelf



Stopping Time: The Photographs of Harold Edgerton text by Estelle Jussism, edited by Gus Kayafas (*Harry N. Abrams, Inc., New York City, 1987; 168 pages, illustrated, \$35.00*).

A bullet seen at the instant it explodes an apple; a drop of milk creating a perfect coronet as it splashes onto a tabletop; the lyrical "swirls and eddies" of a tennis player's serve recorded in multiple-exposure sequence. These are images captured in the photographs of scientist-photographer Harold Edgerton, whose quest has been to show what the unaided eye cannot see. Edgerton invented the electronic flash in 1933, using it to record high-speed events. By the mid-1930s he had perfected multiframe imagery, using strobes to capture multiple exposures. He pioneered nighttime aerial reconnaissance photography during World War II, and later invented numerous deep-water sonar probes and cameras used by explorers such as Jacques Cousteau and the Woods Hole Oceanographic Institute team on the *Titanic* expedition. This book features 124 of Edgerton's high-speed images.

Social Security: The First Half-Century edited by Gerald D. Nash, Noel H. Pugach, and Richard F. Tomasson (*University of New Mexico Press, Albuquerque, 1988; 368 pages, illustrated, \$24.95 cloth, \$12.95 paper*).

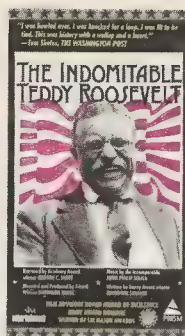
The Social Security Act of 1935 inaugurated a social insurance program that today remains one of the most successful but misunderstood federal undertakings of the century. The fiftieth anniversary of the

act was marked in 1985 by a symposium at the University of New Mexico, the proceedings of which resulted in this volume. The book includes recollections by some of the original framers of the legislation and research by younger scholars, providing a historical introduction to Social Security and corrections of the myths surrounding it. This is the premiere volume in the publisher's Public Policy series that will examine contemporary policy issues of regional and national importance.

Maverick Marine General Smedley D. Butler and the Contradictions of American Military History by Hans Schmidt (*University Press of Kentucky, Lexington, Kentucky, 1987; 284 pages, illustrated, \$28.00*).

This biography documents General Smedley D. Butler's political turnaround from a "hard core" Marine officer to a major spokesman for the League Against War and Fascism and a leader of the veterans' antiwar movement in the 1930s. Said Butler in 1935: "I spent thirty-three years and four months in active service . . . and during that period I spent most of my time being a high-class muscle man for Big Business, for Wall Street and the bankers. In short, I was a racketeer for capitalism." Besides being a provocative account of Butler's establishment-shaking life, the book also contains a political and social history of American military expeditions in the Caribbean, Central America, and the Far East, and the nature of American military policy during the first three decades of this century. ★

Sight & Sound



New World Visions: American Art and The Metropolitan Museum (*Home Vision, P.O. Box 800, Concord, Massachusetts 01742, toll free 1-800-262-8600 or 617-879-1720 in Massachusetts; VHS or Beta, two programs each 58 minutes, \$39.95*).

The two-part series coproduced by WNET/Thirteen and the Metropolitan Museum of Art interweaves painting, sculpture, decorative arts, and architecture in an exploration of American art forms. Using Metropolitan Museum collections as a starting point, the programs were shot on location in New York, Pennsylvania, Washington, D.C., and the New England states. A brief general history of the areas and art forms covered is presented. Program I covers artwork from the seventeenth century to the emergence of the Hudson River School around 1820; Program II continues with nineteenth century landscape and portrait painting, and ends in 1914.

The Indomitable Teddy Roosevelt (*Prism Entertainment, 1888 Century Park East, Suite 1000, Los Angeles, California 90067, 800-541-0454; VHS or Beta, 93 minutes, \$29.95*).

Theodore Roosevelt (1858-1919) led a dynamic life as a lawyer, New York public servant, rancher, naval secretary, Spanish-American War "Rough Rider," vice president, the nation's twenty-sixth chief executive, big-game hunter, and Nobel Peace Prize winner. Propelled into the presidency by William McKinley's assassination, "Teddy" spearheaded construction of the Panama Canal, negotiated the Russo-Japanese Peace Treaty, created the Food and Drug Administration

(FDA), and was instrumental in setting aside millions of square miles of public lands for national parks. This sparkling, witty movie presents a masterful portrait of an authentic American hero. Period film footage depicts Teddy in many of his various roles, from an African safari to the presidential podium. Narrator George C. Scott adds a dramatic touch to Bob Boyd's performance as Teddy, and a John Philip Sousa musical score sets the mood for this recipient of numerous film awards.

Vietnam: The War at Home (*MPI Home Video, 15825 Robroy Drive, Oak Forest, Illinois 60452, 312-687-7881; VHS or Beta, 100 minutes, \$29.95*).

This film documenting the 1960s antiwar movement in America focuses on the all-American town of Madison, Wisconsin, site of a mid-sixties protest that joined radical students at the University of Wisconsin with mothers, businessmen, politicians, and even Vietnam war veterans. Present-day interviews with former participants provide a retrospective overview. The film's mood is set at the beginning with clips of Bob Dylan in concert, Martin Luther King, Jr. leading sit-ins and protests, Richard Nixon's visit to South Vietnam, and live news broadcasts from Vietnam battlefields. Demonstrations with placards proclaiming "Hell no, we won't go," the Chicago Convention riots, the Kent State shootings, Marines landing in Vietnam (while "The Ballad of the Green Berets" plays in the background), and Karl Armstrong's bombing of the Army Math Research Center are other events pictured in this Academy Award nominee. ★

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TO THE MEMORY OF THE GALLANT MEN HERE ENTOMBED AND THEIR SHIPMATES WHO GAVE THEIR LIVES IN ACTION ON DECEMBER 7, 1941 ON THE U.S.S. ARIZONA

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	S2c	N S LEWISON	FC3c	W O MILLER	SM		

Memorial and final resting place for more than a thousand of her crew, the rusting hulk of this once-powerful battleship endures as a solemn reminder of “that day of infamy.”

USS Arizona

The Memories Do Not Die

by Ann Jensen

SUNDAY, DECEMBER 7, 1941.

7:55 A.M.: Japanese bombers and torpedo planes, launched earlier from a six-carrier task force about two hundred miles north of the Hawaiian island of Oahu, begin a surprise attack on the U.S. Pacific Fleet at Pearl Harbor.

7:56 A.M.: The first of dozens of torpedoes and bombs hits the line of seven battleships moored just off Ford Island.

7:58 A.M.: The awful alarm is broadcast to American armed forces, the United States government, and the world: “Air Raid, Pearl Harbor—This is no drill.”

By 8:25 A.M. on December 7, every one of the eight active American battleships at Pearl Harbor had been sunk or damaged. Most would be out of operation for months or years, and two would never fight again. The Japanese had effectively neutralized the Battle Force of the U.S. Pacific Fleet and catapulted the United States into World War II.

The most devastating loss of any that day was the USS *Arizona*, flagship of Battleship Division One. She was hit several times but might have survived had it not been for a single armor-piercing naval gun projectile, converted for use as a bomb, that struck and penetrated her forecastle deck, igniting intense fires within the ship. Seconds after the bomb hit, six of the *Arizona*’s main powder magazines exploded, tearing apart the forward portion of the hull. Minutes later the 608-foot-long, 32,000-ton battleship sank. It was the greatest single loss in U.S. Navy history, claiming the lives of 1,177 of the ship’s crew. Among the casualties were Rear Admiral Isaac Kidd, commander of Battleship Division One, and the *Arizona*’s commanding officer, Captain Franklin Van Valkenburgh.

Gunner's Mate James W. Green survived the destruction of the USS Arizona on December 7, 1941, and later took part in salvage efforts aboard her.

GUNNER'S MATE James W. Green was on board the *Arizona* that Sunday morning, watching helplessly as the first wave of attacking planes dove on the ships moored along Pearl Harbor's "Battleship Row."* One of only about 330 *Arizona* crewmen to survive the attack, he later took part in salvage operations on the submerged wreck of the battleship. Following the war Green became a mechanic; today, retired, he lives in Troy, Michigan.



From their battle stations inside turret No. 4, which housed three of the *Arizona*'s fourteen-inch guns, Green and the rest of the gun crew could do nothing to help defend their ship. Designed for use against surface targets, the main battery guns had a range of more than fifteen miles but were useless against the close-in attacks of the Japanese bombers and torpedo planes. All that the men inside the turret could do was take turns peering through the view ports to see what they could of the action.

The gun crew had no warning of the massive explosion that ripped the *Arizona* from her bow to her mainmast at about 8:10 A.M. "They said the ship rose twenty feet out of the water," Green recalls. "We didn't know that, but the explosion knocked us down inside the turret and then the lights went out."

The gunners eventually were able to turn on the battle lamps, but smoke and gas fumes soon drove them out onto the quarterdeck amid the wreckage and tangle of wounded and dead. There was no power or water pressure with which to fight the flames burning furiously on the ship. The men from turret No. 4 joined others who were loading the wounded into motor launches and life rafts.

"We had to help those who were still living to get off," Green says. "We were getting machine gun fire from enemy planes and when I was just about to leave the ship, I got hit in the leg."

Green never knew whether a bullet or shrapnel hit him. He knew only that he had to get off the rapidly sinking ship. The quarterdeck was less than a foot above the surface of Pearl Harbor when he plunged into the water, amid a rain of bullets and debris, to swim about 130 yards to Ford Island. There, in a bomb shelter near the beach, a corpsman cleaned the oil from Green's eyes and dressed his wound.

Less than nine minutes after the explosion wracked

the *Arizona*, the once-mighty warship settled to the harbor bottom in about forty feet of water, taking with her more than a thousand of her crew. The ship's mangled superstructure and tripod masts remained exposed above the surface, scorched by the magazine explosion and burning oil from her ruptured fuel tanks.

BY TEN O'CLOCK the attack had ended, and Green had boarded the battleship *Tennessee*, which lay in the berth immediately ahead of the *Arizona*, her stern dangerously close to the conflagration.

"The heat was so intense that we were afraid the *Tennessee*'s powder magazines and the ammunition in the turrets aft would blow," says Green, who joined the *Tennessee*'s gunners in removing ammunition from turret No. 4. "They had to flood the magazine and run the screws to circulate the water and try to cool it off," he says. "There was no way to fight the fires on the *Arizona*. She burned for two days."

The Navy moved immediately to recoup its losses on that "day of infamy," refloating some of the vessels along Battleship Row and salvaging what it could use from the others. Captain Cassin Young of the repair ship *Vestal*, which had been moored alongside the *Arizona* at the time of the Japanese attack, was in charge of the initial salvage operation. His crew was on the *Arizona* as soon as the fires were extinguished.

Because of the widespread devastation in the harbor, there was an acute shortage of divers. Volunteers were sought, especially among those familiar with the sunken ships. Green and his buddy from turret No. 4, Louis "Jake" Pacetti (now deceased), were among those chosen and trained for the grim task of removing equipment and recovering their shipmates' corpses.

"As you walked along, the air from your diving helmet created a whirlpool," recalls Green. "It would draw the bodies toward you." The *Arizona* ultimately gave up 105 of those who went down with her.

Divers were unable to reach most areas in the devastated bow section of the ship, where virtually none of

Commissioned in 1916, the Arizona was an aging but still-powerful battleship in December 1941.

Modifications during 1929-31 had upgraded her engineering plant, strengthened the armor protection, added a torpedo defense system, extended the range of the twelve fourteen-inch guns, replaced cage masts with tripod director towers, increased firepower of the secondary armament, and added scouting aircraft. Here the Arizona steams with other major fleet units sometime during the 1930s.

*Operational battleships moored alongside Ford Island included the *Arizona*, *California*, *Maryland*, *Nevada*, *Oklahoma*, *Tennessee*, and *West Virginia*. The fleet flagship *Pennsylvania* was under repair in a drydock in the nearby navy yard. The *Arizona*, *California*, *Nevada*, *Oklahoma*, and *West Virginia* all sank or were grounded as a result of the attack.



A frame from a motion picture (right) shows the instant of detonation as nearly two million pounds of ammunition erupt on the Arizona, seconds after the battleship was hit by a modified Japanese armor-piercing projectile.

Smoke from the Arizona and other burning ships obscures the sky (below), as a motor launch pulls a survivor from the waters of Pearl Harbor. Battleships in the background are the West Virginia, settling to the harbor bottom after being torpedoed, and the Tennessee, moored just ahead of the stricken Arizona.

The surprise attack, which sank or damaged twenty-one U.S. warships, destroyed nearly two hundred military aircraft, and killed 2,403 Americans, was a great tactical success for Japan, but it had, as its naval commander Admiral Isoroku Yamamoto later realized, "awakened a sleeping giant and filled him with a terrible resolve."



U.S. ARMY PHOTOGRAPH; COURTESY OF USS ARIZONA MEMORIAL AND NATIONAL PARK SERVICE VISITOR CENTER



the crew had survived. Compartments around the forward turrets had disappeared, blown away by the upward force of the exploding magazines, while those farther aft, in the region below the toppled tripod foremast, were crushed or mangled by the shock wave passing through the ship. "We just couldn't get in," Green says, "especially in the forward part of the superstructure where it was tilted at a forty-five-degree angle."

The divers concentrated instead on the areas they could reach in the stern. They dove into the powder magazines and various storerooms and cabins aft.

"We took all the guns out and brought up ammunition, equipment, the officers' swords, and other things like that," says Green, who spent much of his time below collecting gas masks from storeroom C311 just aft of turret No. 4.

The underwater salvage effort on the ships in Pearl Harbor was dangerous work. "We lost one diver who went down by himself on the *Utah*," Green says. "He fell through an open hatch and his air control valve jammed. Before another diver got down there, he'd suffocated. So after that, we always sent two divers down."

Rear Admiral Isaac Kidd had been on the bridge of the *Arizona* when the magazines exploded. Although his body was never recovered, a discovery early in the salvage operation left no doubt that he perished there. His son, now Admiral Isaac Kidd, Jr., who was a young naval officer at the time of the Pearl Harbor attack, remembers: "One of the salvage crew found my father's Naval Academy class ring fused to the steel of the *Arizona*'s conning tower," he says, "and Captain Young had the ring restored and sent it to my mother."

Later, divers also retrieved the rear admiral's uniforms and dress sword from his cabin, and those were also sent home to his widow, along with a large, extremely heavy wooden shipping crate. Not until years later did the younger Kidd discover the box in the basement of his mother's Annapolis, Maryland home.

"It had never been opened and had been in my mother's basement for thirty years," Kidd, Jr. says. "I was consumed by curiosity."

Inside the box was the bronze quarterdeck plaque from the *Arizona*. The younger Kidd immediately took it to the director of naval history in Washington, D.C., who then shipped the plaque to Honolulu where it would later be displayed in a memorial to the battleship and her lost crew.

MOST SALVAGE WORK on the *Arizona* ended by mid-1942. The salvagers had cut away and removed the battleship's heavy tripod masts and superstructure, in anticipation of possible efforts to refloat the hulk. They also recovered the ship's smaller guns and various pieces of machinery and equipment, including the aircraft catapult on the stern, for reuse and spare parts. Turret No. 2 was cut open and its three fourteen-inch guns salvaged, and, after much effort, turrets No. 3 and

4 and their guns and machinery were dismantled and recovered. These were claimed by the Army for conversion to shore batteries for the defense of Oahu.*

Despite the extensive salvage work, no detailed surveys, drawings, or underwater photographs of the *Arizona*'s wreckage were made during the war years, and only sketchy reports were filed concerning her condition. Those who could make on-site examinations were needed elsewhere for more urgent duties.

Meanwhile, the Navy's Bureau of Ships worked slowly and methodically at piecing together evidence that might lead them to an understanding of what caused the destruction and sinking of the *Arizona*. In 1944, using the reports of the salvage divers, a film showing the bomb strikes and final explosion on the *Arizona*, and knowledge of the ship and her stores of ammunition, the Bureau finally arrived at a reasonable explanation for the ship's loss.

According to Bureau investigators, available data indicated a strong likelihood that a third-deck hatch in the forward part of the ship had been left open on the morning of the Pearl Harbor attack. It exposed a passageway leading to a small magazine containing the ship's highly volatile black powder supply,** which was surrounded by the *Arizona*'s six forward smokeless powder magazines.

The smokeless powder stored in the magazines was relatively stable. A projectile such as the one that hit the *Arizona* might possibly have ignited this ammunition, causing it to burn with intense heat, but it should not have made it explode. But the ignition of even a small amount of black powder would have created the violent wave of heat and pressure needed to detonate the smokeless powder.

Apparently the bomb started furious fires above the waterline, which rapidly gained access to the magazine area through the open hatch. Resulting detonation of the black powder magazine caused a "sympathetic detonation" of the 1.8 million pounds of main battery ammunition stored around it.

FOLLOWING THE SALVAGE OPERATIONS, the *Arizona* was left alone, although throughout the war she served as an unofficial memorial and was rendered honors by passing ships.

In 1950, a flagpole was installed on the battleship's hulk so that once again she might fly the colors, and a concrete landing was built to allow visitors to look down on her remains.

Finally, in 1962, a permanent memorial—a graceful 184-foot-long white concrete structure spanning the warship's hull—was built and dedicated to the men of

**Only one such installation was completed before the end of the war. Main-battery guns of the Arizona, in the form of "Battery Pennsylvania," fired one last salvo when they were sounded to announce VJ-Day, August 15, 1945.*

***About 1,100 pounds of black powder—most of it intended for use in the ship's saluting batteries on ceremonial occasions—was contained in the magazine.*

the *Arizona* and others who had died at Pearl Harbor. On the marble wall of a shrine at one end of the memorial were inscribed the names of those who died aboard the *Arizona*.

In 1980 the U.S. National Park Service assumed responsibility for operation of the memorial and a new \$5 million shoreside visitor center built across the harbor. By that time, after nearly four decades of submersion, decay of the ship's decking had become obvious and several deck structures had collapsed.

In view of the *Arizona*'s deteriorating condition and the scant information available regarding what remained of her, the Park Service began planning a formal underwater archaeological survey to document her appearance and condition. The *Arizona* Memorial Museum Association donated \$10,000 to get the work underway.

The archaeological survey, a combined effort between the National Park Service's Submerged Cultural Resources Center (SCRC) in Santa Fe, New Mexico and Navy divers on duty at Pearl Harbor, began on September 21, 1983.

Before the survey commenced, however, Navy Explosive Ordnance Disposal divers took the precautionary measure of searching for any explosives still on the ship. No one had really expected to find any, so it came as a surprise when the divers discovered five live five-inch antiaircraft shells and a half-dozen live antiaircraft machine gun rounds on the *Arizona*'s deck less than one hundred feet from the memorial. Mysteriously, the ammunition was not of the type used by any gun on the *Arizona*. The shells were removed without mishap, but their origin has yet to be determined.

SCRC divers schooled their Navy counterparts in underwater survey methods as they proceeded to lay out a grid, using a mile of twine, from which they could chart the wreck with precision and establish permanent reference points for future use in monitoring any settling or shifting of the hulk.

According to Gary T. Cummins, then superintendent of the *Arizona* Memorial, "the ship was found to be virtually covered by a rich growth of marine organisms, including barnacles, oysters, anemones, corals, sponges and grasses." That growth, coupled with the fact that the divers were working at depths of up to forty-two feet with a visibility of only five to seven feet, caused some initial disorientation in the divers.

At no time during the survey operations conducted between 1983 and 1986 did the divers enter the ship or disturb anything they found. Nevertheless, they were very much aware of the presence of those who went down with the *Arizona*. "They had a feeling they weren't alone," says Navy diver Brian O'Connor. "It created a strong sense of awe."

Not only reverence for the dead, but danger as well, precluded any entry into the ship. While the heavy layer of marine growth seemed to be helping to preserve much of the hull from salt water corrosion, there was no way of knowing how stable any structure was or what dam-

age lay hidden beneath sea growth and silt.

The forward portion of the *Arizona*, from the fore-castle to the center of the ship, is almost unrecognizable. For a distance of about two hundred feet, the upper decks are almost completely blown away, with a large, armored section peeled back to port and jutting over the side. The sides of the ship in this area are also bulged out several feet from the force of the explosion. "The battle damage is extremely severe, especially just aft of the bow," says Cummins. "The hull at that point is cracked from the gunwale on the port side, two-thirds of the way to the gunwale on the starboard side."

The divers confirmed what salvage crews had discovered in 1942: turret No. 1 remains essentially intact, but it now rests on the third deck, more than twenty feet below its original location. The heavy barbette or armored tube that once supported the turret was shattered or displaced by the magazine explosion. The turret lies in an almost level position, with its three gun barrels still in alignment.

Elsewhere on the *Arizona*'s now-submerged decks the divers found the remains of fire hoses that crewmen had deployed in futile attempts to fight the raging fires during the ship's last minutes afloat. The decks are also littered with spars, steel fragments, and other debris.

The survey revealed that, apparently as a result of corrosion, some of the huge plates from the steel armor belt around the hull have broken loose and fallen into the mud. In other areas, the layers of armor are beginning to separate. For reasons still unexplained, most such deterioration is occurring on the starboard side of the hull.

The divers found that the portion of the *Arizona*'s hull between the memorial and the stern still retains a semblance of its original appearance, except for the absence of guns, turrets, and superstructure. On close investigation, they found more holes in the deck and sides of the ship than could be accounted for by the five to eight bomb hits reported by eyewitnesses during the attack. The investigators concluded that the additional openings were cut during the wartime salvage operations to remove machinery and equipment.

With the aid of strong lights, the divers could see into a few of the compartments. Broken dishes lay in the galley, and everywhere silt and marine growth covered the decks, fittings, and furniture.

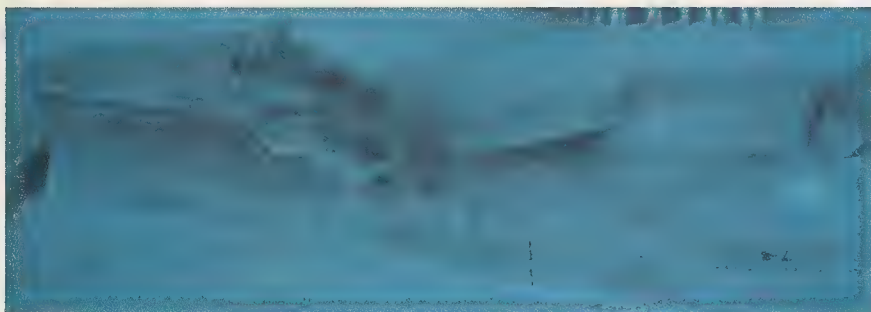
As they worked, the divers sought evidence that the *Arizona* had been hit by aerial torpedoes before the bomb detonated her magazine. Although Navy records do not mention torpedo damage, some survivors of the attack were convinced that they saw torpedoes hit the battleship.

"A careful search of the ship's port hull failed to locate any evidence of torpedo damage," Cummins says. "Because the ship settled at a five-to-ten-degree port list, holes in the lower port side of the vessel caused by torpedoes could be obscured by the hull resting directly on them."

"This question is likely to remain in doubt," he



PHOTOGRAPH BY IRWIN MALZMAN FOR DOUGLAS PEEBLES PHOTOGRAPHY, HONOLULU



COURTESY OF ROBERT SUMRALL

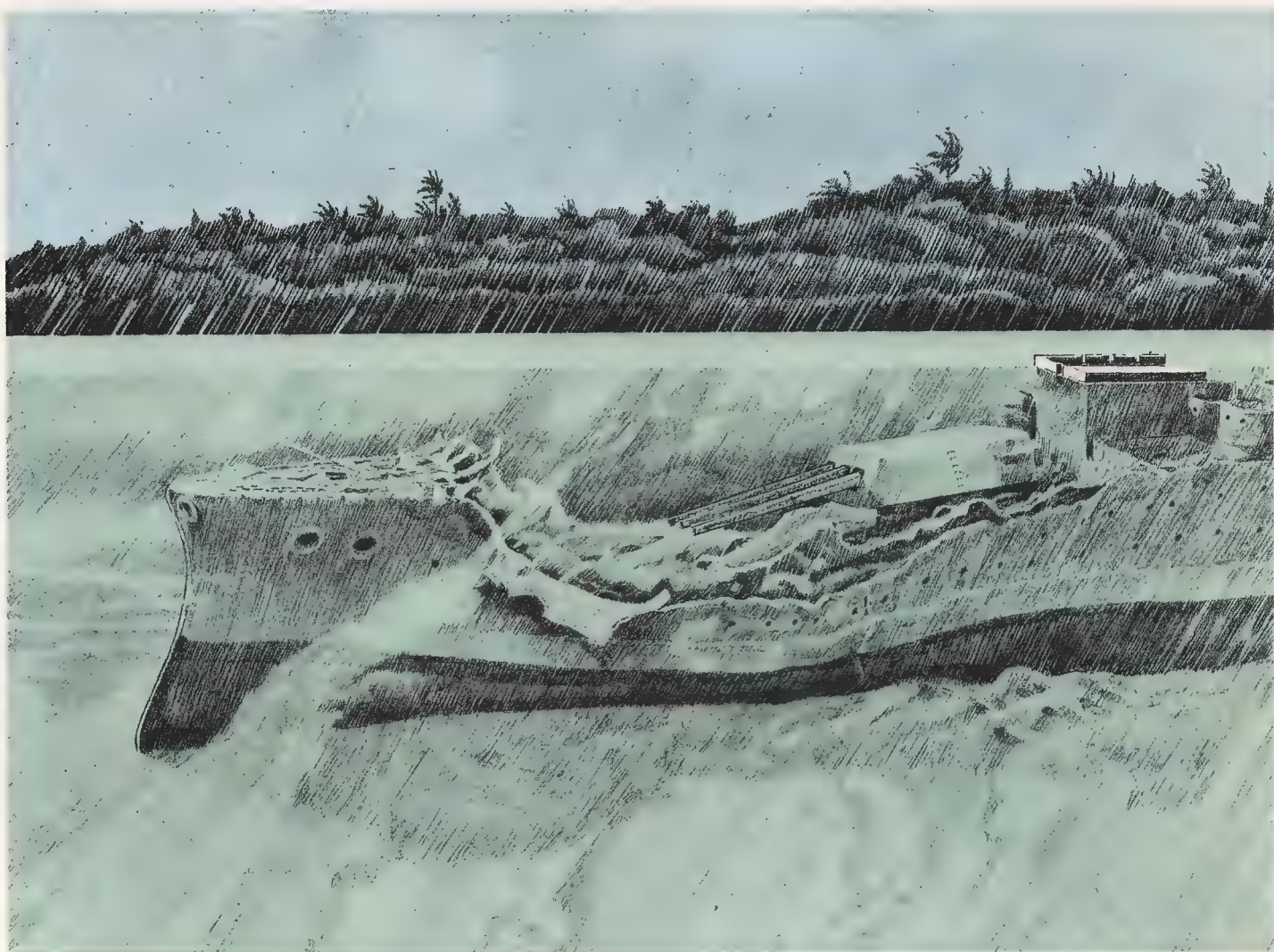
Now spanned by the graceful Arizona Memorial, the hulk of the slowly decaying battleship is faintly visible beneath the surface of Pearl Harbor in an aerial view (above). Identifiable features include the submerged forecastle at far left, partially dismantled turret No. 1 at left center, and barbette for turret No. 3 at right center.



PHOTOGRAPH BY MARK STEPHENSON FOR WEST LIGHT PHOTOGRAPHY, LOS ANGELES

A detail of the Arizona model (upper left) at the Visitor Center shows the devastation wrought on the forward part of the ship by the explosion of her magazines.

The Arizona is one of America's most-visited military shrines; each year about 1.4 million people tour the shoreside Visitor Center and then board a Navy launch for the short ride to the Memorial (left), where they can look down on the remains of the warship, and read the names of the men who died aboard her nearly a half-century ago.



notes, "as divers will never be permitted to enter the hull, and pumping away silt and mud from beneath the lower port hull could cause the ship to settle further, causing additional damage."

BEYOND CLASSIFYING the battle and salvage damage, establishing the position of the ship, and documenting the remains, the recent surveys served another purpose. The park rangers at the *Arizona* Memorial found that the resulting drawings of the ship provided an important instructional tool. But they also realized that a model of the wreck would be even more informative for visitors at the memorial.

As a result, during later dives made in 1985 and 1986, detail was added to the drawings at a scale that would make it possible to build an exact scale model of the wreck, revealing the hull's true form beneath its thick layer of marine growth and the murky waters of Pearl Harbor.

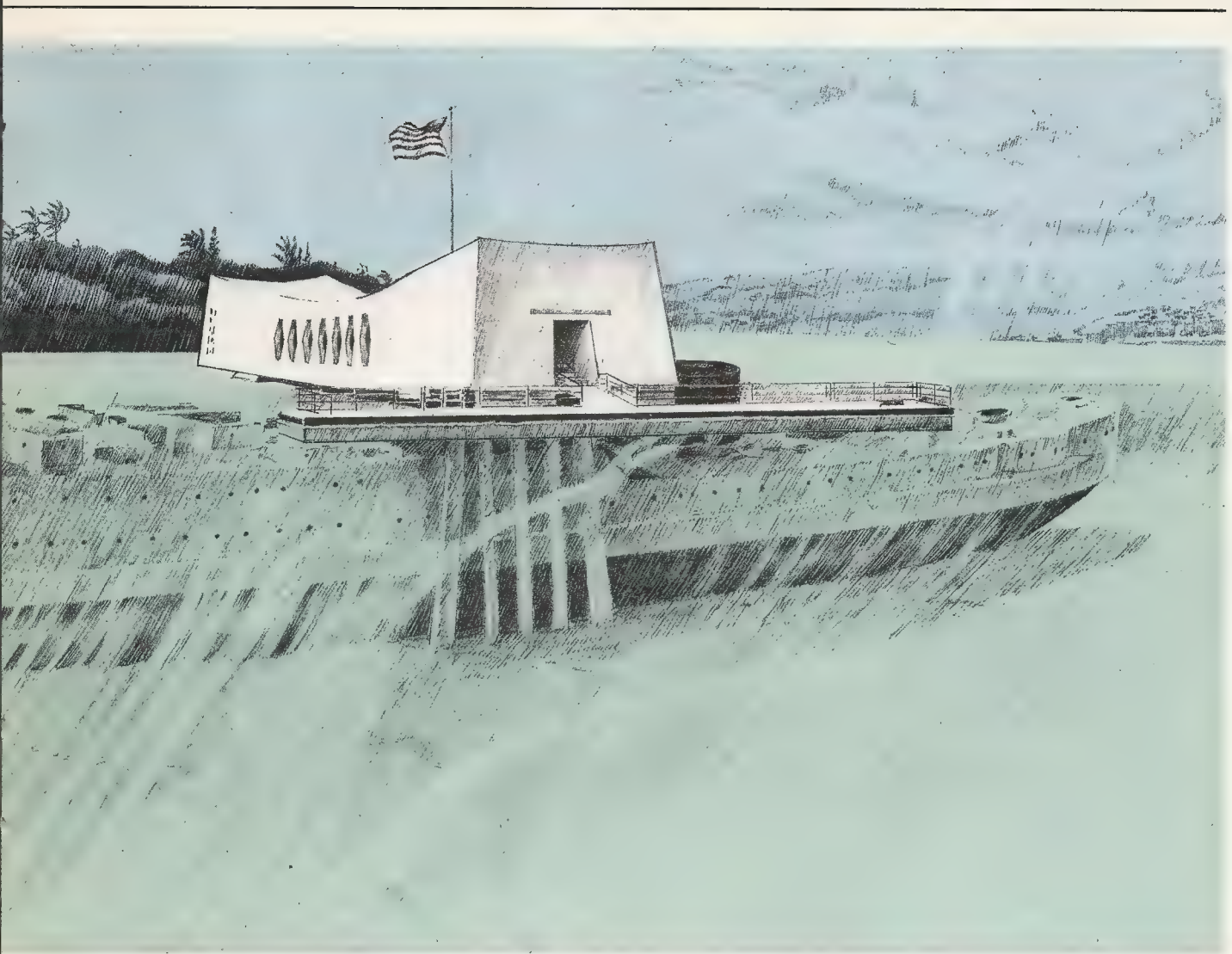
The model was subsequently commissioned by the *Arizona* Memorial Museum Association, to be donated to the National Park Service for display in the museum. Creation of the replica was undertaken by model shipwright Robert F. Sumrall of Annapolis, Maryland. An

authority on U.S. Navy warships, Sumrall is also curator of ship models at the U.S. Naval Academy Museum.

Modeling the *Arizona* presented a unique challenge. The wreck scarcely resembles the battleship's former appearance, most of her identifying features having been destroyed, salvaged, or transformed into a tortured and twisted mass of metal. Much of the debris littering the remains of her decks cannot be identified.

Collaborating closely with Park Service personnel and the divers who had been involved in mapping and surveying the wreck, Sumrall and his assistant, modeler Glenn Staubitz, painstakingly re-created the wreck of the *Arizona* from a wide variety of materials that included molded fiberglass, wood, epoxy putty, electrical wire, plastic casing, and brass tubing. Their first step was to construct an exact-scale wood model of the ship's hull as it was before the Pearl Harbor attack. At that point, Staubitz, an expert in working with fiberglass, fashioned sheets of styrene and other materials into the multitude of odd and twisted shapes that form the wreckage today.

"As a model builder, I could fully appreciate the work that went into charting the wreck and making the drawings," Sumrall says. "It was the excellent detail of



the survey drawings that made it possible to re-create the *Arizona* accurately in three dimensions with all the unusual contours and textures of the actual ship."

"You still had to use your imagination to re-create the ship from drawings," notes Sumrall. "While shadows on the drawings might indicate a certain depth where a bulkhead had caved in, it took a lot of experimenting with different textures to convey a true sense of the condition of the ship."

The eight-foot model was completed and installed at the *Arizona* Visitor Center in April 1987. With it and the detailed information obtained from the surveys, park rangers are now able to tell the story of the *Arizona* as never before.

BENEATH THE JADE GREEN WATERS of Pearl Harbor, the *Arizona* remains a ghostly shadow. Covered with silt, coral, and nearly half a century of undersea growth, the shattered hull is barely recognizable. But every year more than a million visitors take the short boat ride across Pearl Harbor to the *Arizona* Memorial. There they gaze down at what can be seen of the ship, attempting to reconstruct in their minds the devastation that sent her to the bottom. They come to pay tribute to

the dead and to better understand the events that brought the United States into World War II. For such visitors, the *Arizona* is instructive as few other warships sunk in that war can be. She and the target battleship *Utah*, which lies close by in the harbor, are among the small number of lost ships that did not go down in deep water, forever lost to view.

Time and the relentless workings of the sea will one day complete the destruction of the *Arizona* that began on December 7, 1941. But for now and many years to come, she will retain her unique place in history. As Admiral Isaac Kidd, Jr., said of his father's last flagship, "although she was officially sunk, she never really went down. The *Arizona* still sails, if only in memory." ★

The USS Arizona Memorial Visitor Center, located at No. 1 Arizona Memorial Place, Honolulu, Hawaii, is open from 7:30 A.M. to 5:00 P.M. daily. Boat tours to the USS Arizona Memorial operate from 8:00 A.M. to 3:00 P.M. For recorded tour information, telephone (808) 422-0561.

A free-lance writer living in Annapolis, Maryland, Ann Jensen specializes in maritime and naval history with a particular interest in the history and vessels of the Chesapeake Bay region.

Louis Prang: Father of the American Christmas Card

by Kathleen Doyle



LIKE any good entrepreneur might, Boston lithographer Louis Prang saw the opportunity to reach new customers for his printing company by passing out business cards at the Vienna Exposition of 1873. Floral designs on tinted or black backgrounds adorned the small cards, and the firm's name was proudly displayed in the center.

The cards achieved Prang's primary intent: other business owners ordered similar ones from him. But about a year later, Mrs. Arthur Ackermann, the wife of his London agent, suggested that Prang insert "holiday greetings" into the space ordinarily occupied by the firm's name and sell them as Christmas cards.

Prang, never one to shy away from a potential market, followed the recommendation and shipped a selection of cards to England in time for the Christmas season.* His vividly colored greetings were an instant hit, prompting him to market a larger line of Christmas cards in the United States in 1875, where the custom was relatively unpracticed.

Already America's preeminent color lithographer by 1875, Louis Prang had made the study of color reproduction a lifelong pursuit. Born in Prussian Silesia in 1824, he became an apprentice at age thirteen in his father's calico dyeing and printing factory. Later Prang moved to Westphalia to continue his training in these techniques; from there he went on to help manage a paper mill and then spent five years in Bohemia as a journeyman printer and dyer.

At age twenty-four Prang returned to Germany, but he was soon forced to leave again because of alleged involvement in the Revolution of 1848. He fled to Bohemia, then Switzerland, and finally to America.

Prang arrived in New York in 1850 and then went to

**The first authentic Christmas card was printed in London in 1843. The custom really began to gain popularity in England during the 1860s, however, when Charles Goodall & Son began printing visiting cards for Christmas use.*

Boston, where, in 1856, after several failed business attempts, he formed a lithographic company in partnership with Julius Mayer. In 1860 the partnership dissolved, and he continued as L. Prang & Company.

Prang's first success was in printing Civil War maps and card-size portraits of military leaders. In 1864, anticipating a growing market for lithography and determined to match the excellence of prints made in Berlin, he took his family to Europe where he could study the most up-to-date color processes.

He returned to America to perfect chromolithography, an exacting process by which images are printed in color with a series of lithographic stones. Before Prang and others perfected this method, prints, posters, and cards were almost colorless; even Currier & Ives's early reproductions were black-and-white copies with splashes of color brushed on by hired girls.

Prang's chromolithographs made faithful reproductions of fine art affordable to average Americans for the first time, and he became renowned for the quality of his work. He used the process to reproduce paintings by such famous artists as Eastman Johnson, Albert Bierstadt, Thomas Moran, and Winslow Homer.

Prang also used the chromolithographic process on his Christmas cards. His company was soon producing more than five million cards annually. The cards were marketed by stationery stores and cost from about ten cents for small cards to about one dollar for larger, more elaborate ones. These prices, considered high for the time, were due to the high cost of production, which involved successive impressions from as many as twenty lithographic stones with as many inks.

Prang's early cards were small, about the size of today's playing cards, and printed on only one side. Designs included flowers, birds, butterflies, the Nativity, Santa Claus, angels and cherubs, children, and snow scenes. Often attached to the card was a ribbon that read "Merry Christmas" or "Happy New Year."

Some of the card designs were entries from the Christmas card contests Prang held annually during 1880-1884, and for which he offered generous prizes. With their introduction, large cards—six-by-eight-inches or seven-by-ten-inches—became common.

Prang disliked "gimmicky" cards, but he occasionally succumbed to popular styles; some cards were cut in diamond or star shapes or edged with tinsel; others



were decorated with fringe borders or blown-glass frosting to simulate snow; and some had a silk cord for hanging. Some cards contained scented sachets.

The greeting text, written in couplets or prose, varied to fit the design. Some verses were by Longfellow, Whittier, and Bryant, but most were written to order by poets Celia Thaxter and Emily Shaw Forman.

Prang's cards were much sought after, having no equal in quality. As one admirer wrote, his "eight-color productions were so completely in a class by themselves that young ladies who got them for Christmas, often wrote down in their diaries 'This year I received twenty Prangs.'"

By the 1890s a number of other companies had begun supplying Christmas cards—including inexpensive German imports—to the American market. Prang could not meet the competition without sacrificing quality, so he retired from the field in 1897.

From then on Prang concentrated his efforts on printing other items, particularly art education books. In 1882 he had formed the Prang Educational Company after noting the lack of materials suitable for teaching art to children. Prang and his second wife, Mary Dana Hicks, the company's publications editor whom he married after his first wife's death, began to travel extensively to promote art training and use of the firm's educational materials.

Prang died in California on June 14, 1909. Nine years later the Prang Educational Company was dissolved and sold to the American Crayon Company.

The chromolithographic art prints that brought Prang his chief fame have long since been replaced by more sophisticated and practical forms of color reproduction, and Prang himself has been relegated to an obscure niche in the history of printing. But the holiday custom he helped to popularize in this country continues to thrive. In 113 years, the number of greeting card companies producing Christmas cards has expanded from Prang's single firm to about 850 such publishers. And this December Americans will exchange 2.2 *billion* Christmas cards as they send best wishes of the season to their families and friends—tangible expressions of holiday spirit that we owe in part to Prang's vision and skill. ★

Kathleen Doyle is articles editor for American History Illustrated.



Introduced a half-century ago, the first manmade fiber heralded a whole new group of wonder materials that serve us today in nearly every area of life.

Of Miracles and Molecules

The Story of Nylon

by Roger Bruns

MAY 15, 1940. American women charged into department stores across the country to buy the latest trend-setting garment. The hype and wait were over. Nylons had arrived.

"Expect Something Pretty Wonderful," newspaper headlines from Chicago to Washington to Los Angeles proclaimed. "You'll Thank Your Lucky Stars for Chemistry."

Women swarmed to the counters, buying more than four million pairs of nylon hosiery in one day, exhausting the available stock. Reports of "Nylon Riots" hit the newspapers as the fashion-conscious clamored for more. Saggy cotton hose were out of style; sales of expensive silk stockings slumped. This was the day of nylon, the sleek fabric for a new age.

THE REMARKABLE new synthetic material had been introduced in the spring of 1939 at the New York World's Fair in Flushing Meadows.* The revolutionary

**Nylon was introduced simultaneously at a Du Pont exhibit at California's Golden Gate International Exposition on Treasure Island.*



Scientific progress heralding the "World of Tomorrow" at the 1939 New York World's Fair was particularly well exemplified in the Du Pont Company's pavilion, "The Wonderful World of Chemistry" (opposite). Highlight of the exhibit was the introduction of the new synthetic wonder fiber nylon—modeled in the form of nylon stockings (above) by Du Pont models. The hosiery created a sensation, attracting millions of eager shoppers when it reached department stores in 1940.

chemical discovery was one of many wonders displayed in hundreds of acres of exhibits surrounding the exposition's thematic Trylon and Perisphere: eight-foot metal robots talking and singing; a manmade lightning display, with 10-million-volt bolts jumping a thirty-foot gap in a cracking flash; a modernistic "House of Glass"; "psychic cars" driven by remote control; an invention known as "television"; and a gigantic igloo—an experience in "air conditioning."

For Americans still suffering from the shock of the Great Depression and troubled by the ominous rumblings of European conquest by Nazi Germany, the \$155 million "World of Tomorrow," as the New York fair was called, inspired strength and hope. For architects, city planners, scientists, and engineers, this was an unmatched opportunity to inspire Americans and the world with the marvels that were nearly in their grasp.

The fair's themes of progress, invention, and hope were especially exemplified in the building called "The Wonderful World of Chemistry." The exhibit, created by the E.I.

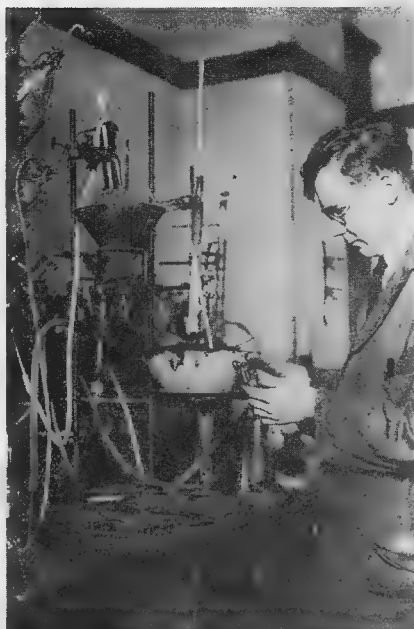
du Pont de Nemours & Company, was a testament to the genius of science. A 105-foot tower symbolizing a mammoth laboratory apparatus rose above the entrance to the edifice. Five sweeping mural plaques made from Du Pont plastics illustrated research processes. An elaborate marionette show on five stages celebrated the use of chemical products such as gunpowder, acetate, cellophane, and artificial rubber. And a "color show" dazzled fairgoers as light of every conceivable hue emanated from chemical crystals illuminated by polarized light.

But the spectacular news from "The Wonderful World of Chemistry," the discovery that fired the imagination, that bespoke the unlimited possibilities of scientific research, was the debut of nylon. Inside the Du Pont building a huge machine rolled out sheer nylon stockings, simulating their transformation from raw materials to finished product. This exhibit explained how chemicals found in coal, water, and air were synthesized to produce a new, purely synthetic fabric with unequalled physical properties. Chemists at the Du Pont exhibit showed visitors the thin nylon filaments and expounded on their nearly infinite uses.

The Du Pont Company hailed the new substance as one of the most significant discoveries in chemical history. "Every believer in democracy should find a revived confidence in America and its industrial institutions," declared Lammont du Pont, president of the company. "Told here is the story of what is right with the country, in contrast with the emphasis over the last decade on what is wrong with it."

The future, he continued, would bring forth marvelous new industries and products, particularly synthetic materials never before imagined. In the magnificent discovery of nylon the country could find inspiration.

MORE THAN a decade earlier, in 1928, the Du Pont laboratories had launched a program of fundamental, "pure" research on chemical products and processes. Seeking to broaden the company's scope beyond the manufacture of



As head of the Du Pont Company's program of fundamental molecular research, Dr. Wallace Carothers (top) pioneered studies of superpolymerization processes, laying the groundwork for the development of nylon and a host of other synthetic materials. Julian Hill (above), a colleague of Carothers, re-enacts the discovery of the first manmade fiber as he pulls a molten mass of polymer out of a test tube, stretching it into a thin fiber. The original discovery was made by Hill at Du Pont's experimental station near Wilmington, Delaware, in 1930.

chemicals and explosives, executives had lured a Harvard instructor named Wallace H. Carothers to organize and oversee scientific investigations and to conduct his own research.

Moody, melancholic, and shy, Carothers was nevertheless a passionate and daring researcher. He gathered around him a dozen expert organic chemists. The team members were not restricted to working in areas that would produce findings with immediate business applications; rather, they were told to work toward an understanding of the nature of certain chemical processes. The program was funded, a Du Pont official said, by "patient money"; the company expected no quick return.

From the program's beginning, Carothers and his small group sought to direct their work into areas where current scientific research seemed stalled.

Carothers was particularly intrigued and mystified by the "polymerization" process by which certain molecules unite in nature to form giant molecules or superpolymers such as those found in rubber, cellulose, and resins. He and his fellow researchers hoped to study not only polymerization, but to learn how other big chain molecules might be built out of small ones.

Using polarized light, x-ray beams, and various sophisticated mathematical stratagems, the research team began creating an almost endless number of molecular combinations. The work was exacting, complicated, and grinding. But the team forged ahead, methodically arranging and rearranging, creating new patterns, shapes, and physical qualities. Carothers, the consummate researcher, delved into the giant puzzle, calculating and plotting new steps and directions.

The first polymeric material that held promise as a product useful to society was neoprene, the first successful synthetic rubber. Creation of the substance by Carothers's group was achieved in part due to earlier research conducted by Rev. Julius Arthur Nieuwland, C.S.C., an organic chemist at the University of Notre Dame.

Then, one day in 1930, Dr. Julian

How Nylon is Made

THE NYLON-MAKING PROCESS takes such basic elements as carbon, hydrogen, nitrogen, and oxygen as found in coal, petroleum, natural gas, air, water, and other substances, to create an entirely new arrangement of matter in a unique molecular structure.

Du Pont chemists define nylon as a generic name to designate all materials known as "synthetic, fiber-forming polymeric amides. . . ." The product has somewhat the same composition as the proteins of which silk, hair, and wool are common examples. Nylon, however, does not have an exact chemical counterpart in nature. Unlike rayon, a semisynthetic fiber made by a complex reshuffling of cellulose molecules (the skeletal stuff of all vegetable life), nylon is truly synthetic, chemically different than any known natural product.

Two chemical compounds, hexamethyl diamine and adipic acid, both of which contain carbon and hydrogen, are used to make nylon. The two materials are placed in an autoclave and heated under pressure so that their molecules will combine to form larger molecules. The resulting substance is hexamethylene-diammonium-adipate, commonly

called nylon salt.

Following this polymerization process, the melted nylon comes out of the machine as a plastic ribbon that must be cooled and hardened on a metal roller. The ribbon is then cut into small pieces that are blended for uniformity.

To make nylon fiber, the blended pieces are melted over heated grids covered with inert gas that prevents the oxygen in the air from mingling with the melted nylon. After the nylon liquefies, it is extruded through small holes in discs called spinnerets. The threads harden as they make contact with the air and are then wound onto spools.

Until the nylon is cold-drawn, the thread-like molecules that compose the nylon filament are widely spaced and lie in a chance arrangement. When the thread is stretched during the extrusion process, the molecules fall into parallel lines, drawing the polymer chains from a helter-skelter arrangement into permanent bundles.

Nylon is properly known as an industrial material rather than a fiber. The name covers a whole class of materials that includes molded forms of the superpolymer as well as fibers. ★

What's In A Name?

WHEN FIRST DEVELOPED, Fiber "66" lacked a short, catchy name. Du Pont officials sought a nontechnical, easy-to-pronounce generic term for the superpolymer. A committee considered more than four hundred names, including "Duparoo" (from "Du Pont pulls a rabbit out of hat"), "Duproh," "Duparon," "Delawear" ("Like the First State It Is the First Synthetic Textile"), "neosheen," "Duponese," "pontella," "klis" ("silk" spelled backward) and "lustrol."

As the date for the product's introduction approached, the naming committee began juggling words and letters. At the time, Fiber "66" was being tested for use in women's full-length hosiery, where the fiber's greater strength, elasticity, and run resistance indicated its superiority to silk. The results of this research prompted one scientist to propose that the new product be christened "norun," and this term became the basis for the name "nylon."

First, letters were switched to form "nuron." Then, after many hours of meetings, the "r" was changed to "l," spawning "nulon." But that name was soon dropped; it was too close to an existing registered trademark, and was subject to misspell-

ing as "newlon." Eventually, the "u" was changed to "i", making "nilon," but that was thought to have too many different pronunciations: "nillon," "neelon," and "nylon." The committee preferred the last pronunciation so the "i" was changed to "y" and the product name was launched.

"Nylon"—the word and product—were launched on October 27, 1938 at The *New York Herald Tribune* Forum. The forum was a preview of the New York World's Fair, 1939-1940, which was dominated by the towering Trylon theme structure. People immediately speculated that the "ylon" in "nylon" stemmed from "Trylon." Others thought the "ny" came from New York and the "lon" from London, or that the word had some sort of political implication.

One German author writing about the advent of nylon claimed that Dr. Carothers coined the name himself. But Carothers died almost a year and a half before the name "nylon" was introduced.

The Du Pont Company dedicated the term "nylon" as a generic in its product announcement both at the forum and in a full-page advertisement in the *New York Herald Tribune* on October 30, 1938. The term was never registered as a trademark. ★

W. Hill, a Carothers associate and researcher also working on polymers, was amazed by the accidental results of another experiment. In attempting to remove a sample of molten superpolymer from the container in which it had been prepared, the chemist noticed that it seemed like warm taffy candy, stretching to several times its original length but still appearing to be relatively strong and elastic. In fact, the further it stretched, the stronger it seemed to become. Hill and his fellow scientists had never seen a substance quite like it.

When the chemists repeated and analyzed the experiment, they found that the substance stretched uniformly to a point of maximum extension, as the polymer chains forming its molecules were drawn from a helter-skelter arrangement into permanent, parallel bundles. Scientists call this process "cold drawing," and it became the key to synthetic fiber formation.

Although the Carothers team had not been searching specifically for a breakthrough in textile fibers, the phenomenon before them suggested a definite research direction—a search for a synthesis of superpolymers from which tough, elastic, water-resistant fibers could be spun.

During the next eight years Du Pont spent about \$27 million financing some 250 scientists to follow the research trail blazed by Carothers. The goal at times seemed so fraught with puzzling research problems, so plagued by subtle, annoying reverses, that the company once considered suspending the operation.

One problem was that the melting point of the experimental fiber was too low for practical applications. If the fiber melted at a moderate temperature, it couldn't be used in textiles that must be ironed. The chemists also discovered that if polyamide chains were allowed to grow too long, they lost strength.

Finally, in 1935, Carothers developed a product called pyrehexamethylene adipimide, also dubbed "66" because both chemicals used to make it contained six carbon atoms. With a melting point of 482 degrees Fahrenheit, the substance



In 1942 the restriction of all nylon production to war-related applications made nylon hosiery America's most-sought-after scarce consumer item. Here movie star and pinup queen Betty Grable donates her nylons—just auctioned for \$40,000—at a war bond rally.

would be suitable for textiles.

Two years later, on April 9, 1937, the Du Pont Company filed an application for a patent on synthetic fibers. In the application a statement by Carothers noted that "insofar as I am aware the prior art on synthetic polyamide fibers, and on polyamides capable of being drawn into useful fibers is nonexistent."

Carothers and his colleagues had achieved a remarkable scientific breakthrough—the first synthetic fiber. Patent No. 2130948 was issued, and for years afterward many scientists around the country could recite that number from memory.

The long, arduous research had brought scientific triumph to Carothers, but it had also taken a deep psychological toll. Twenty days after the patent for the new fibers was filed, Carothers, alone in a Philadelphia hotel room—

exhausted, ill, and steeped in depression—drank cyanide mixed into a glass of lemon juice. The Du Pont team's elation at their remarkable scientific breakthrough was marred by human tragedy.

Carothers's work laid the basis for much of modern polymer science. He had organized the whole field of polymerization, supplied it with techniques, strategies, and a vocabulary, and had established a remarkable groundwork for a revolutionary manufacturing process in chemicals.

Over the years the fruits of Carothers's pioneering research would lead the way to other polymer substances that include the non-stick fluorocarbon Teflon; Nomex, an effective fire-resistant material; Kevlar, a light, tough fabric used in flak jackets and helmets; super-tough Zytel resin for engineering applications; and other synthetic fibers like Orlon acrylic, Dacron polyester, and Lycra spandex. Today other scientists are applying polymer technology to the fields of semiconductors and computers.

ON OCTOBER 27, 1938, Du Pont officials announced to the world the development of a group of new superpolymers from which fibers could be spun. The fibers, they said, would surpass in strength and elasticity any organic material—including cotton, linen, wool, silk, and rayon.

Nylon's characteristics seemed remarkable at the time. Nylon yarns were found to be abrasive- and crush-resistant, almost nonflammable, and nearly nonabsorbent in water. Weight-for-weight, the fibers were stronger than steel. They could be set in almost any woven state at high temperatures, thereafter retaining that shape through repeated washings.

As engineers and chemists began to work with the new miracle substance, they quickly discovered the astonishing uses to which it could be adapted. At their experimental station in Wilmington, Delaware, Du Pont scientists designed a stunning array of products—hosiery, neckties, laces, screens, surgical sutures, paintbrushes, violin strings, and



coatings for electric wires.

In the spring of 1938 the company began construction of a nylon factory at Seaford, Delaware, about eighty miles from Wilmington. Within nine months they coaxed the first nylon filaments through the spinnerets.

The first applications for the new substance were as bristles for toothbrushes and as fishing lines and surgical sutures. Then, early in 1939 the Du Pont Company began commercial production of nylon hosiery.

On October 24, 1939, following preliminary wear-testing by Du Pont employees, the first nylon stockings appeared in several Wilmington stores. Prompted by newspaper stories and rumors about the attractive appearance, toughness, and relative low cost of the new stockings, lines of customers snaked along Wilmington streets toward department store entrances. By 1 P.M. most of the stores had sold their entire stock.

Favorable reports from women who had purchased hosiery in Wilmington made it clear that silk stockings had a formidable competitor. One headline even declared: "Nylon Threatens 500,000,000 Japanese Silkworms." Nylon, Ameri-

cans learned, could be knit sheerer than silk; moreover it didn't snag as easily and would cost no more. The hosiery, it was rumored, shed water like a duck and wouldn't spot when rain-splashed.

A few naysayers (perhaps encouraged by silk interests) cast doubts about the new fabric's safety. One rumor circulated that a Vassar student who wore nylon hose had accidentally touched a lighted cigarette to her leg and had ignited herself like a human torch. Nylon, Du Pont officials quickly pointed out, is virtually nonflammable.

Encouraged by the initial trials, Du Pont inaugurated nationwide nylon hosiery sales on May 15, 1940. Before the year ended, more than sixty million pairs of nylon stockings would be sold.

"It is a real synthetic," a *New York Times* editorialist wrote in May 1940, noting the discovery and introduction of nylon. "As such it is both a triumph of the industrial laboratory and a new approach to the problem of changing the environment of man."

The discovery of nylon was a time for celebration, for acknowledging an extraordinary human achievement. Perhaps through the progres-

For years after the return to a peacetime economy, production of nylon hosiery failed to meet the demand. Here, would-be stocking buyers line up for limited supplies in Boston, Massachusetts, in November 1945.

sive and liberating force of technology man was moving toward a more perfect society, a utopia. No longer would man be utterly dependent on "animals, plants, and the crust of the earth for food, raiment, and structural material." This was, indeed, a "Triumph of Synthesis." As Grover Whalen, president of the World's Fair, had declared, "The tools for building the world of tomorrow are already in our hands."

BUT THE NEW AGE that had seen the introduction of nylon and other wonders at the 1939 World's Fair was rapidly changing. In Flushing Meadows the wrecking crews slammed giant balls against abandoned fair pavilions. For those who strolled through the wreckage of the once-inspiring "World of Tomorrow," uncertainties and ominous portents clouded the future. The

Continued on page 48

The American Museum of Natural History possesses the world's finest array of Northwest Coast Indian art. A new book illustrates and celebrates this unparalleled collection.

From the Land of the Totem Poles

by Aldona Jonaitis

Color photography by Stephen S. Myers

THE AMERICAN MUSEUM OF NATURAL HISTORY in New York City possesses the finest array of Northwest Coast Indian art in the world. Acquired between 1880 and 1910, during the great age of anthropological collecting in coastal British Columbia and southeastern Alaska, these marks, charms, textiles, and totem poles testify clearly to the extraordinary artistic talents of the Northwest Coast Indians.

These Indians created art for two complementary purposes: to enhance the status of their elite chiefs, and to signify the magical powers of their shamans.

Civilization reigned in the villages of the Northwest Coast. Here were immense houses in which fifty or more related individuals lived. Totem poles positioned before those houses indicated, by their height and sophistication of carving, which families had particularly high positions in the society. To maintain their superior rank, families frequently hosted elaborate and lavish feasts, known as potlatches, at which large quantities of food were consumed and many gifts distributed. Potlatches were also the occasions for hosts and guests alike to don their fanciest and most elegant clothing. The artworks belonging to the chiefs, from totem poles to clan hats, depicted images symbolic of their status.

This portfolio is adapted with permission from material in From the Land of the Totem Poles: The Northwest Coast Indian Art Collection at the American Museum of Natural History by Aldona Jonaitis with color photographs by Stephen S. Myers (American Museum of Natural History, New York, and University of Washington Press, Seattle, 1988; 272 pages, \$35.00). Copyright 1988 by the American Museum of Natural History. (A pictorial calendar based on this book is also available: Totems & Talismans: Northwest Coast Indian Art, published by the American Museum of Natural History and Universe, New York City; distributed by St. Martin's Press; \$8.95.) Book and calendar are available from the Museum as well as in bookstores.

The chiefs, whom village citizens admired and respected, had little power over dangerous spirits who could cause illness, death, bad weather, poor fish runs, and other natural disasters. To control these creatures, the Northwest Coast Indians looked toward their shamans, men who had acquired special abilities to interact with the supernatural world. The artworks of the shaman depicted the spiritual beings who populated the world beyond the safety of the village.

During the time the American Museum was acquiring the splendid artworks illustrated on these pages, photographers were traveling around the coast, taking pictures of villages, totem poles, and art objects *in situ*. Like the collecting activities themselves, these photographs were intended to be records of what some believed to be "dying" cultures. By the turn of the century, some totem poles had been left to rot, standing before deserted houses; missionaries claimed that shamanism had been eradicated; and the Canadian government had outlawed the potlatch. However, some people on the Northwest Coast did continue to carve and paint, and to participate in traditional ceremonies. Indeed, Northwest Coast cultures never "died." Art that today impresses us in the Northwest Coast collection of the American Museum of Natural History is part of a living artistic tradition, as any traveler to British Columbia or Alaska will surely note. For the contemporary Northwest Coast Indians, art is clearly still a part of life. ★

Representing the sun, the wooden mask on the opposite page was the creation of Bella Coola Indians on the central coast of British Columbia. It was collected in 1897 by German anthropologist Franz Boas and his Tlingit assistant George Hunt.



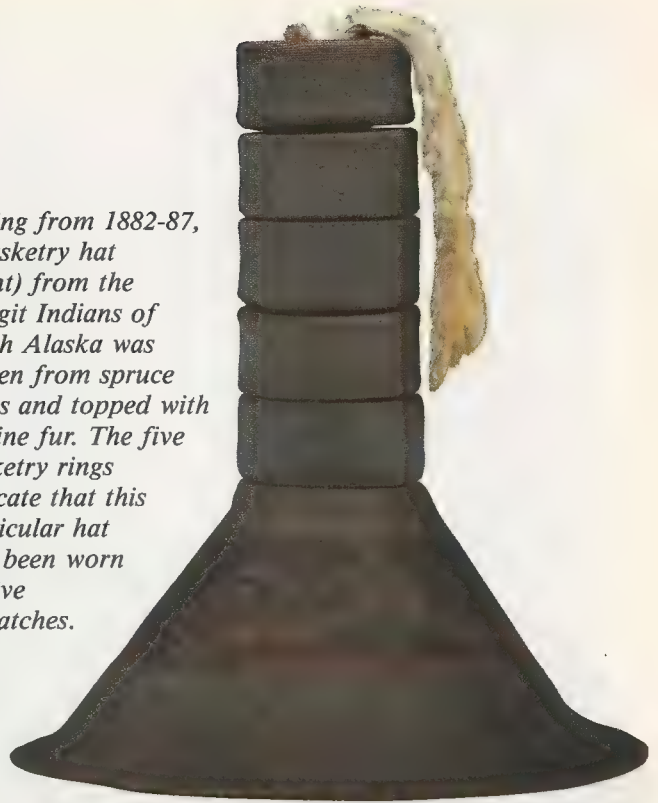
Finery for the Potlatch

Much of the artistic activity among Northwest Coast Indians went into creating costumes to be worn at Potlatches. The headdress at right, used during ceremonial dances on such occasions, was collected from among the Haida Indians of British Columbia in about 1880-85 by Dr. Israel Wood Powell, superintendent of Indian Affairs for the coastal Indians of that province. Carved from wood and decorated with abalone shell, flicker feathers, sea lion whiskers, and ermine pelts, the headdress represents a beaver with a dragonfly on its belly. Similar headdresses appear in the photograph at upper right, which dates from roughly the same period and shows Haida artists Tom Price and John Robson.





Dating from 1882-87, a basketry hat (right) from the Tlingit Indians of south Alaska was woven from spruce roots and topped with ermine fur. The five basketry rings indicate that this particular hat had been worn at five potlatches.



Woven from shredded cedar bark and mountain goat wool, Chilkat blankets like the one above were worn throughout the Northwest Coast. Composed of three panels, each blanket contained abstract images of the owner's crest animal, the central panel presenting a frontal depiction and the side ones representing its profile.

Carved from Cedar

The Kwakiutl Indians of British Columbia were noted for their complex, baroque artistry. Their dance masks, like the ones just below and at right, were often cleverly animated. When strings were pulled, masks representing certain figures snapped open to reveal entirely different characters. The transformation mask below, depicting the Raven, opens to reveal the Raven of the Sea. The remarkable mask at right opens to reveal, in turn, three entirely different beings: a man's face inside a sea raven inside a smiling bullhead.



An unusual carved helmet (right), representing a man's face twisted as if hit with a blow or suffering paralysis, was worn by a Tlingit warrior of south Alaska to protect him from his enemy's blows.



The Kwakiutl village of Newitti (above), photographed in 1881, was located off the north end of Vancouver Island.

A large Kwakiutl wooden bowl, right, depicts an elegantly carved whale, under whose jaw crouches a man, seemingly crushed by the cetacean's weight.



Spirit World of the Shaman

Tlingit shamans were supernaturally powerful individuals whose responsibility it was to cure the sick, control the weather, accompany war parties, and ensure an abundance of fish and berries.

When a Tlingit Indian fell sick, his family would call upon a shaman who, accompanied by his family, would enter the patient's house for a consultation. As the shaman's family pounded rhythmically on the floor with beating sticks, the sorcerer changed into his costume and started shaking his bird-form rattle. Attracted to the sounds, the evil spirits causing the

illness flew into their images painted and carved upon the shaman's costume and masks.

When the shaman donned his masks, he believed that he was actually being transformed into the spirits depicted on them. As he put on and took off his array of paraphernalia, the spirit power in him intensified, causing his dancing to become increasingly frenzied and convulsive. Finally, entering a trance state, he became conscious only of the spiritual forces filling his body and soul. At this point he had the mystical power to ensure the patient's recovery.



One of the most powerful forms of shamanic art was the face mask. One such example (above), made from wood, human hair, and eagle tail feathers, depicts a dead shaman's spirit whose eyebrows are wolves.

In a photograph dating from about 1889 (right), a Tlingit shaman poses as if curing a patient.

To defend himself and his wards against malicious supernatural beings, the Tlingit shaman owned a variety of batons that he used like clubs. A number of spirits engage in violent activities on such a baton (opposite), including a land otter seemingly crushed between an anthropomorphic human face and a crow in whose long, sharp beak stands a naked man, his eyes opened wide as if being choked.



A shaman's wooden rattle (left) depicts a magical oystercatcher bird on whose back sit three small witches in the process of planning evil activities; these malevolent creatures are being guarded and transported through the air by a mountain goat near the handle.



A wood and fur mask (below) represents a man undergoing the most frightening experience imaginable to the Tlingit—his werewolf-like transformation into a land otter.



Land of the Totem Poles



The Haida lived on the Queen Charlotte Islands off the coast of British Columbia. To communicate to the world the fabulous wealth and concurrent status of their chiefs, they erected some of the most magnificent totem poles and most impressive houses on the Northwest Coast. One of the most important of the Haida villages was Masset (opposite page), with its tremendously rich and powerful chief, Wiah. Wiah's house (visible behind the seated group of villagers) was so immense—nearly seventy feet wide and capable of holding one hundred people—that it was called the “Monster House.” According to legend, two thousand Haidas helped construct it.

A model (above) carved by Haida artist Charles Edenshaw preserves the memory of another great Haida structure, built in the mid-1800s by the carver's uncle in the village of Kiusta. Edenshaw carved many other models for museum collections; some critics today write that he suffused his art with a sadness expressive of his great culture's decline.

This and thousands of other artifacts housed in the North Pacific Hall at the American Museum of Natural History comprise the world's finest collection of art from Alaska and British Columbia. Assembled nearly a century ago, it today forms a monument to the interactions among humans from vastly different cultures who treasured these artworks for their beauty, their symbolism, and their eternal magic. ★





This Pilgrim couple's romance is celebrated in poetry and legend—but a true historical portrait of John and Priscilla Alden remains elusive.

John and Priscilla, We Hardly Know Ye

by Alicia Crane Williams

Archly the maiden smiled, and, with eyes overrunning with laughter, / Said, in a tremulous voice, "Why don't you speak for yourself, John?" "The Courtship of Miles Standish"

WITH THIS half-question, half-statement, legend says, Pilgrim maiden Priscilla Mullins subtly implied her interest in marrying John Alden, who had just proposed to her on his friend Miles Standish's behalf. But she should have asked Alden to put such a proposal in writing; then history might have provided a better record of the private lives of these celebrated Plymouth lovers.

Of all the stories surrounding the *Mayflower* and those who journeyed to the New World aboard her, the romantic triangle of Miles Standish, John Alden, and Priscilla Mullins is probably the most beloved. In 1858 poet Henry Wadsworth Longfellow, a descendant of John and Priscilla Alden, immortalized them with his retelling of the legend-

ary romance in "The Courtship of Miles Standish." Much of Longfellow's narrative was based on tradition rather than documented fact; but whether it is accurate or not, John and Priscilla's love story has become a part of American lore.

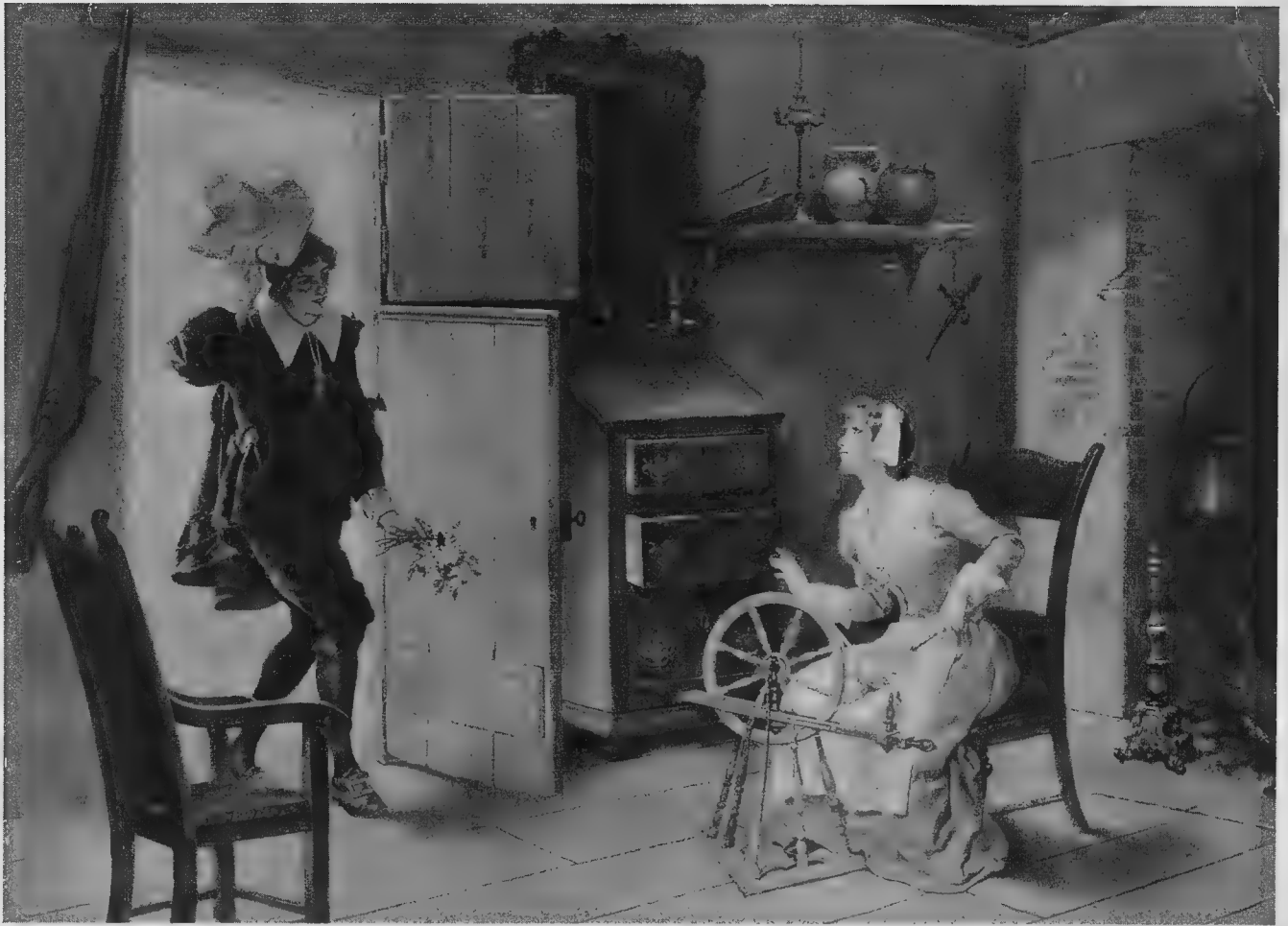
While legend paints a charming picture of this Pilgrim couple, a true portrait of them remains elusive. Unfortunately, three centuries after their deaths, history tells us very little about the real John and Priscilla Alden.

WILLIAM BRADFORD, governor of the Plymouth* Colony, left the only contemporary account of John Alden: "John Alden was hired for a cooper at Southampton wher the ship victuled, and being a hopefull young man was much de-

**Sixteenth-century writers spelled the name of the Pilgrim company and its Massachusetts settlement several ways—including "Plimoth." For consistency, the modern spelling is used throughout this article.*



JOHN AND PRISCILLA ALDEN (ARTIST UNKNOWN); CULVER PICTURES, NEW YORK CITY



sired, but left to his own liking to go, or stay when he came here, but he stayed, and married here.”

John’s great-great grandson, Rev. Timothy Alden, born in 1736 (fifty years after John Alden’s death), printed the first biography of the family in 1814. His account contains the only known physical description of John, “who is said to have been a man of most excellent form with a fair and ruddy complexion.” There is no description of Priscilla.

In a document written in 1682, John Alden deposed that he was “aged 83 years or thereabouts,” and when he died in 1687 he was said to be “about” eighty-nine years of age. So John appears to have been born about 1599, and he was approximately twenty-one years old when the *Mayflower* sailed for New England in 1620.

Alden had joined the *Mayflower* company at Southampton, England, but nothing relating to his family has been found in that city. He was probably in Southampton

only to look for work; his origins may be elsewhere. Numerous theories regarding his background have been advanced, but none proven.

The most intriguing hypothesis regarding John’s parentage involves an Alden family in Harwich, Essex, England. Captain Christopher Jones of the *Mayflower* was from Harwich. His mother’s second husband (Jones’s stepfather) was Robert Russell. Russell’s sister Ellen married a John Alden who, in 1586, shortly before the Spanish Armada attempted to invade England, was held captive in Spain. John and Ellen had a son John who was baptized in Harwich in 1579. This John “Jr.” would have been only twenty years old in 1599 when John of the *Mayflower* was born. Most young men during this time did not wed until they could support a wife, so it would have been unusual for a lad of twenty to be married. But the possibility remains that he fathered an illegitimate child.

A second theory involves an Al-

Dispatched on a lover’s errand, a reluctant John Alden visits Priscilla Mullins on behalf of his friend:

“So I have come to you now, with an offer and proffer of marriage/Made by a good man and true, Miles Standish the Captain of Plymouth!” Alden family tradition recalls this episode much as it is described in Henry Wadsworth Longfellow’s famous poem, “The Courtship of Miles Standish”—but, as with many other legends concerning the Pilgrim couple, history is silent as to whether such an incident actually happened.

den family in Windsor, Berkshire, England. This family had a John Alden baptized in 1602 (baptisms often occurred one or more years after a birth), who was probably the son of Thomas Alden, a beer brewer. Where better to learn the cooper’s trade than in a brewery? Thomas Alden died in 1611, leaving

his son John an orphan.

Whether orphan, illegitimate child, or just adventurous youth, John Alden of the *Mayflower* was apparently free to cut any family ties and leave England forever. Having probably just finished an apprenticeship as a cooper or carpenter, he was a lucky catch for the Pilgrims. His task of caring for the ship's barrels of beer and drinking water was vital to the survival of passengers and crew during the two-month, storm-ridden North Atlantic voyage.

At journey's end, Alden joined forty other men in signing the Mayflower Compact, creating a civil body politic to make laws and elect officers who would administer the new colony's government. An eclectic collection of adventurers and religious dissenters began a new life in a new world.

President John Adams, an Alden descendant, has been quoted as saying that John Alden was "the strippling, who first leaped upon the rock"; "the rock" being, of course, the famous Plymouth Rock. As is the case with many other *Mayflower* legends, it is impossible to confirm whether Alden was actually the first to set foot on Plymouth Rock—or whether the Pilgrims even landed there. The rock, a glacier-deposited boulder located near the high-water mark of the otherwise flat Plymouth beach, could certainly have been used to avoid wading through icy water, but all beyond that must remain conjecture.

Once on shore John almost certainly helped to construct the rude shelters that housed the cold, sick colonists through the devastating winter of 1620-21. That spring, after half the colony had perished of "the Great Sickness" (probably pneumonia or tuberculosis aggravated by scurvy), Alden's carpentry skills and his youthful strength would have been fully employed as the plantation was established.

Although in Longfellow's poem Standish says that John Alden is "bred as a scholar," whether John had any academic education while in England is unknown. Once in the Plymouth colony he probably found ample opportunities to learn from such men of letters among the Pil-

grims as Bradford, Edward Winslow, and William Brewster.

PRISCILLA MULLINS also traveled to the New World aboard the *Mayflower*, but, unlike John Alden, she was not alone. Priscilla's father (a boot and shoe dealer), her mother, and her brother Joseph accompanied her. Two of Priscilla's other siblings remained in England. Some have claimed that the Mullins were French Huguenots, but this is yet another unsupported conjecture.

Priscilla was probably born in Dorking, Surrey, England, where the Mullins family had lived for at least two generations, but her birth date and record have never been found. She is presumed to have been of marriageable age, probably in her late teens, when she voyaged on the *Mayflower*.

Unfortunately, Priscilla's brother and parents died the first winter in the colony, leaving her an orphan. Her father had made a will in February 1621, however, and in it he left her all his goods "in Virginia" (New England). She received a direct inheritance of ten pounds and the income from the sale of dozens of shoes and boots worth forty pounds. She was therefore a considerable heiress in the little colony. John, a cooper, might well have felt himself below Priscilla's station, which could help to explain his reluctance to court her.

Captain Miles Standish's supposed courtship of Priscilla is a story that eludes contemporary documentation. The nineteenth-century family biography by the Rev. Alden contains the earliest reference to such a possible relationship. Alden says that "Mrs. Rose Standish, consort of captain Standish, departed this life on the 29 of January, 1621. . . . In a very short time after the decease of mrs. Standish, the captain was led to think, that, if he could obtain miss Priscilla Mullins . . . the breach in his family would be happily repaired. . . ."

In Longfellow's poem, Standish implores Alden to "Go to the damsel Priscilla, the loveliest maiden of Plymouth,/Say that a blunt old Captain, a man not of words but of actions,/Offers his hand and his

heart, the hand and heart of a soldier./Not in these words, you know, but this in short is my meaning;/I am a maker of war, and not a maker of phrases./You, who are bred as a scholar, can say it in elegant language."

And John, despite his own romantic feelings for Priscilla, agrees after some hesitation: ". . . The name of friendship is sacred;/What you demand in that name, I have not the power to deny you!"

But Priscilla quickly refuses Standish's offer: "Why does he not come himself, and take the trouble to woo me?/If I am not worth the wooing, I surely am not worth the winning!/. . . When one is truly in love, one not only says it, but shows it./Had he but waited awhile, had he only showed that he loved me,/Even this Captain of yours—who knows?—at last might have won me,/Old and rough as he is; but now it never can happen."

Rev. Alden's description of the legendary proposal—based on a family story "carefully handed down by tradition"—is poetically simple. "Miss Mullins listened with respectful attention, and at last, after a considerable pause, fixing her eyes upon him, with an open and pleasant countenance, said, 'prithee, John, why do you not speak for yourself?'" John is reported to have blushed, taken his leave "with a look, which indicated more" and eventually returned to propose for himself.

The exact date of John and Priscilla's marriage is unknown, although they were certainly married while living at Plymouth Plantation. She was single when her father's will was recorded in February 1621 but had probably married John by 1623, by which time she is not separately listed in a land division. By May 1627 John and Priscilla were definitely married and had two children, Elizabeth and John; as these facts are contained in the records for the division of cattle.

Longfellow also wrote another Alden legend—how Priscilla rode home from her wedding on John's snow-white bull that was "covered with crimson cloth, and a cushion placed for a saddle": "Alden . . . /Brought out his snow-white bull,

obeying the hand of its master,/Led by a cord that was tied to an iron ring in its nostrils,/ . . . She [Priscilla] should ride like a queen, not plod along like a peasant."

This post-wedding ride is otherwise undocumented. There were certainly no horses in the colony at the time of John and Priscilla's marriage, a fact that might explain the reason for her unusual mode of transportation, but it is unclear whether there were any cattle there either. All livestock had to be imported from England. Some smaller animals, such as chickens and pigs, were on the *Mayflower*, but exactly when the first bull arrived was not documented. Captain John Smith recorded that in 1624 there were some cattle and goats in Plymouth.

Longfellow's poem further describes the bull as Alden's personal possession: "Raghorn, the snow-white bull, that had fallen to Alden's allotment/In the division of cattle . . ." But before the division in 1627, all livestock was owned in common rather than by individuals. Quite possibly the "snow-white" bull is Longfellow's literary invention.

THE PLYMOUTH SETTLERS originally planned for all land and profits to be held in common. This "communism" soon became unworkable under the inevitable friction between those working and those not but nonetheless reaping the rewards. So, in 1623, the leaders of the colony divided land among those "which first came over in the May Floure." John Alden and Miles Standish were among those who received land about ten miles north of the Plymouth settlement in an area that later became known as Duxbury.

John's own industriousness and his marriage to Priscilla seem to have quickly raised him to the Pilgrims' upper ranks. In 1626, at age twenty-seven, Alden was among the fifty-three Plymouth men who paid eighteen hundred pounds to purchase the colony from the original "Adventurers"—the merchant speculators who had financed the *Mayflower* voyage in hopes of reaping profits from the colony through fishing and trade. When profits

proved elusive, the Pilgrims negotiated to buy out their sponsors.

The next year, 1627, Alden moved amid even more exclusive company. He and seven other of Plymouth's leading men, along with four of the "Adventurers" in England, "undertook" the responsibility of paying the entire debt to the rest of the "Adventurers" in exchange for such considerations as monopolies on fur trade. Final payment on the debt was made in 1642. The men such as Alden who financed this were known as "Undertakers." The transaction shows Alden's high standing in the colony and his equality with such Pilgrim leaders as Bradford, Standish, and Brewster.

In 1650 Bradford calculated the "increasings and decreasings" of all who had journeyed on the *Mayflower*. He noted that William Mullins's daughter Priscilla had "married with John Alden who were both living, and have 11 children. And their eldest daughter is married and hath five children." However, in the margin where Bradford totaled the "increasings," he wrote "15." Eleven children added to five grandchildren should be sixteen. The question remains whether the error was in Bradford's total or in the actual number of children or grandchildren.

Only ten of John and Priscilla Alden's children have been identified, despite several candidates for an eleventh. The earliest vital records for the Plymouth colony are lost, and no birth records for any of the Alden children survive. Instead of leaving a will, John deeded his land to some of his children while he was still living. After his death his remaining personal property was divided among the heirs, and ten children are identified by a receipt for this division.

As the Plymouth Plantation became increasingly populated, many of the original *Mayflower* immigrants began farming their land grants during the summer, returning to the colony in the winter months to attend church. By 1632 there were enough families farming in Duxbury to establish a church there.

The Alden family was among those who took up residence in Duxbury. (The cellar hole of John Al-

den's original house in Duxbury has been uncovered by archaeologists and may be seen today.) About 1653 John and his son Jonathan built a larger house nearby, probably using the frame of the earlier house for the kitchen, "borning" room, and pantry of the new. John and Priscilla presumably later died in the new house, which was continuously occupied by Aldens until the early 1900s, when it was deeded to the organization of their descendants called the Alden Kindred of America. It has never been sold outside the family.*

Despite John's move to Duxbury, he remained active in Plymouth colony government. Beginning with the first date in 1632 listed in the surviving records of the colony, John Alden's name appears on nearly every page. He was chosen as an "Assistant" or magistrate, in which capacity he served from 1632 to 1640. Duxbury elected him as one of its representatives to the colony court every year until 1650, when he returned to the office of magistrate until his death in 1687. Three times he was elected treasurer of the colony, and he acted as deputy governor on two occasions. He served on committees to make and review laws, and (often with Standish) settled boundary disputes between individuals and towns. He also served on the councils of war against the Dutch, the French, and the Indians, including King Philip. In total, John served the colony for more than fifty-five years in various civil roles.

The historical record preserves only two instances in which John Alden appears "controversial." The first episode involved a trading post that the Plantation had established on the Kennebec River (near present-day Augusta, Maine). A man named Hocking went up there from Piscataqua to trade, and soon sent word back that he would like to expand trade farther up the river. John Howland, who was in charge

**The three-century-old John Alden house, located at 105 Alden Street in Duxbury, Massachusetts, is open for guided tours several days a week during the summer months and on other occasions by appointment. A modest admission fee is charged. For additional information telephone 617-934-6001.*

of the trading post project, refused permission. The Pilgrim settlers felt that Hocking was threatening the colony by expanding privately into an area in which they had hoped to trade.

Hocking paid Howland no mind, declaring that he would trade as he

*"Lo! when the service was ended,
a form appeared on the threshold,
Clad in armor of steel, a sombre
and sorrowful figure!"*

J.L.G. Ferris's painting depicts the dramatic arrival of Captain Miles Standish at the wedding of John Alden and Priscilla Mullins. Alden and the soldier were well-acquainted, but—again—the historical record cannot verify whether they were rivals for Priscilla's hand.

liked. Howland replied that force would be used to remove Hocking if necessary; then he, Alden, and some other men went to the Kennebec in pursuit of the trader. Once there Howland ordered two men to cut the anchor cable on Hocking's boat. Moses Talbot did so, but as his canoe slipped by, Hocking shot him. Having witnessed the murder from the bank, another of Howland's men shot Hocking.

The story spread all over New England, including Boston, where authorities arrested Alden when he arrived there with a trading vessel, even though he had not been a party to the shooting. The Plymouth colonists sent Standish to secure Alden's release.

The second instance in which Alden appears controversial concerned an issue involving the Quakers. The

residents of Plymouth Plantation never executed a Quaker, but vigorously encouraged them to move away from the Pilgrim settlement. The Quakers apparently expected from John Alden sympathy he was unprepared to give, and in one speech, James Cudworth accused Alden of having "deceived the expectations of many" Quakers and having "indeed lost the affections of such."

BEFORE JOHN ALDEN DIED on September 12, 1687 (Julian calendar*), he had the distinction of being the last surviving signer of the

**England and her colonies did not adopt the presently-used Gregorian calendar until 1752. Consequently, ten days must be added to dates given in Pilgrim records for them to correspond to the modern-day calendar.*





"Onward the bridal procession now moved to their new habitation,/Happy husband and wife, and friends conversing together. . . ." Like some other incidents described by Longfellow, Priscilla's wedding-day ride on John Alden's "snow-white bull" may have been the poet's invention.

Mayflower Compact. Priscilla predeceased him sometime after 1680, when she and John are known to have attended Governor Josiah Winslow's funeral. Priscilla and her husband are presumably buried in the old graveyard of the First Church in Duxbury, but their gravesites are unknown. The original

markers (probably made of wood) have long been lost or stolen. Commemorative markers have been placed by Alden descendants.

The date of John's death is particularly important because it is the only significant date known for either John or Priscilla. It too might have been lost had it not been for three records, one of which was Samuel Sewall's diary entry: "Monday, Sept. 12. Mr. John Alden, the ancient Magistrate of Plymouth, died." Before newspapers as we know them, special occasions were often noted by the printing of "broadside." Two of these single-sheet broadsides published as obituaries for John Alden have survived the centuries. John Cotton titled his broadside, "Upon the Death of that

Aged, Pious, Sincere-hearted Christian, John Alden, Esq." The obituary, in the form of a dreadful poem, claims that John Alden had been in the New World about sixty-seven years when he died: "He came one of the first into this Land/And here was kept by God's most gracious hand/Years sixty seven, which time he did behold/To poor New England mercies Manifold. . . ."

John and Priscilla's ten known children did not achieve their parents' fame. Eight married and settled down to productive lives of agriculture. The eldest daughter, Elizabeth, married a "yeoman, boatman, planter and wheelwright" named William Pabodie and died at about age ninety-three in Little Compton, Rhode Island. Eldest son



John turned to the sea and captained his own coastal trading ships. He came nearest to providing the second generation with some excitement when he unwisely visited Salem in 1692 and was accused of witchcraft. He escaped from jail, avoiding severe punishment or death.

Joseph farmed in Bridgewater, David in Middleboro, and Jonathan inherited the homestead in Duxbury. Ruth married John Bass, a wheelwright of Braintree, and became the ancestress of presidents John Adams and John Quincy Adams. Mary and Priscilla never married.

Daughter Rebecca may have troubled her parents when she was called before a court for alleged "fornication" because she had given birth to

her first child less than nine months after her marriage to Thomas Delano. Several such cases came before the court each session, however, so Rebecca and Thomas were not an unusual couple for the time.

Sarah is the offspring especially worthy of mention in light of Longfellow's poem and its unsubstantiated claim that Miles Standish and John Alden were rivals for Priscilla. Sarah married Standish's son Alexander, and thus their descendants carry the blood of *both* of Priscilla Mullins's legendary suitors.

What the Alden children lacked in historical significance, they made up in numbers. The ten known children gave John and Priscilla at least sixty-eight grandchildren, fifty-eight of whom produced nearly four hun-

dred great grandchildren. Today there are millions of Alden descendants, many of whom are unaware of their ancestry.

Other Plymouth colonists, such as Bradford and Winslow, wrote the histories, diaries, and letters by which the Pilgrims are remembered; John Alden was too busy farming. And though fragments from his public life are documented, little is written about Priscilla after the couple married. It has been left to legends—and to poets—to tell of these Pilgrim lovers' private lives. ★

Alicia Crane Williams is genealogist for the Alden Kindred of America, Inc. She is a descendant of John and Priscilla's daughter Ruth.

Of Miracles and Molecules *Continued from page 29*

fair's "Court of Peace," where representatives of various nations had made speeches about friendship and good will, was plowed under.

As United States troops entered World War II, they took nylon with them. It replaced silk in parachutes and pig bristles in paintbrushes. It was used for cord in B-29 bomber tires; as mosquito screens in tropical field hospitals; as rope for towing gliders and for mooring ships; in flyers' flak vests and anti-blackout ("G") suits; and as tent cloth, carburetor diaphragms, surgical sutures, sewing threads, and filters for blood plasma.

By February 1942 the military demand for nylon was so great that further manufacturing for civilian use was stopped by the War Production Board. The prohibition hit the country just when the demand for nylon hosiery had reached a feverish level. Soon nylons were premium black-market items.

Scores of swindlers and con men peddled fake nylon at exorbitant prices. In New York in 1943, for example, numerous women shoppers were fooled by enterprising scam artists who, on the street, promised them real nylons at \$4 a pair. After following the vendors to nearby buildings to transact the illicit deals, the customers were invariably dismayed by larger price tags. If they purchased the goods anyway, they were warned not to open the packages until later. Alone, in the privacy of homes or offices, the eager buyers would then find rayon stockings of nondescript quality.

The Federal Bureau of Investigation (FBI) seized hosiery in warehouses across the country. Underground stocking manufacturers churned out the hot items for a retail black market price of \$25 a pair, and illegal liquor distributors dealt with illegal hosiery interests in "pair for bottle" swaps.

In a poll conducted by the *Chicago Herald-American*, readers named their favorite hard-to-get-in-wartime "What I Want Most" items. Nylon hosiery was the number-one choice by women, surpassing the next—men—by a ratio of two-to-one. Similar polls in Buf-

falo, New York and Tulsa, Oklahoma elicited the same response. When a woman in Chula Vista, California inherited 160 pairs of nylon hose, she became an instant news item.

American women weren't the only ones thinking about nylons during the war; U.S. fighting men overseas dreamed of luscious limbs draped in nylon. Gracing the lockers of thousands of GIs were pinups of a sensuous Betty Grable, her long legs adorned with nylons.

But most American women weren't wearing nylons when they welcomed their men home at war's end. Manufacturers and merchandisers needed time to retool for the civilian market, and more than two years passed before chronic shortages ended. Initial deliveries to department stores precipitated the same frantic crowds of shoppers that had formed when nylons were first introduced in 1940. The *New York Times* reported that "30,000 Women Join in Rush for Nylons," and in Pittsburgh the story was summed up with "Nylon Mob, 40,000 strong, Shrieks and Sways for a Mile."

SINCE THEN, nylon products seem to have appeared almost everywhere: in outdoor furniture, lace curtains, drapery, upholstery, tennis racket strings, shoes, hoses, seat belts, wheelchair wheels, handbags, sails, luggage, fish nets, tubing, carpets, slip covers, window screens, hairbrushes, shower curtains, and in seats for subways, and buses.

Most Americans in the early 1940s associated nylon with glamour and sex—luxurious hosiery, evening gowns, and lingerie. They thought of dainty fabrics and delicate laces, of intimacy and softness. Now we also associate nylon with tough, abrasive-resistant plastics; bristles of tremendous tensile strength that will not fray or split; virtually unbreakable insulating enamel; rugged and stain-resistant carpets; as well as rope and parachutes that resist mildew, bacteria, rot, insects, and salt water.

Nylon safety netting has protected space shuttles and, more re-

cently, a nylon climbing rope, attached to a harness, is part of a new escape system for astronauts. From basketball nets to pup tents to leotards, nylon proves to be one of the most useful manufacturing substances in existence.

The remarkable diversity of roles played by the synthetic fiber in the five decades since its first commercial use is evidence of its versatility. Nylon has changed the realms of fashion and industry, battlefield and bedroom, household products and outer space.

Nylon has even affected the world's languages. In 1949 a newspaper report out of Cairo, Egypt told of a public clamor to replace an antiquated street car system. The trams in Cairo, it seems, were falling to pieces in an alarming fashion. The cry was for "nylon." Egyptian street hawkers had popularized the synthetic fiber and now the term "nylon" meant modern, sleek, up-to-date; it meant progress.

One well-known, excitable television announcer sometimes even screams, "All Nylon!" when a college basketball player makes a shot so cleanly through the net that it doesn't even touch the rim of the basket.

The World of Tomorrow. A half-century ago millions of individuals at the New York World's Fair were transfixed by visions of the future. Much of that "future" is with us now or even behind us. The speeds, the shapes, the sounds—much of what they saw in Flushing Meadows for only a brief moment—are now commonplace.

As was prophesied to those fairgoers, nylon has played a major role in shaping our "world of tomorrow." And during years to come, as we travel more expansive distances, reach for taller heights, and design new clothes and products for every area of life, nylon will almost certainly be one material that will continue to serve and amaze us. ★

Roger Bruns, director of publications for the National Publications and Records Commission, is the author of The Damndest Radical: The Life and World of Ben Reitman, published by the University of Illinois Press.

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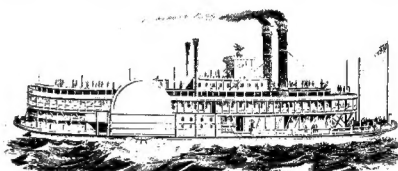
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